



CITY OF HOUSTON

Sylvester Turner

Mayor



HOUSTON AIRPORT SYSTEM

George Bush Intercontinental ~ William P. Hobby ~ Ellington Airport

Mario C. Diaz
Director of Aviation

April 18, 2023

SUBJECT: Addendum No. 4

REFERENCE: Invitation To Bid (ITB) for the FAA Non-Standard Taxiways at William P. Hobby Airport; Solicitation No. H06-HOUTXY-2023-019; Project No. 770

To: All Prospective Bidders:

This Addendum is issued for the following reasons:

I. Extend the bid due date from **April 20, 2023 to April 27, 2023, at 10:30 A.M., (CST).**

II. Replace the following pages with the attached documents outlined below.

1. Pages 18-19 Document 00410A Bid Form – Part A.
2. Pages 20-30 Document 00410B Bid Form – Part B.
3. Pages 423-429 D-705 Pipe Underdrains for Airports.
4. Pages 457-466 L-108 Underground Power Cable for Airports.
5. Pages 467-476 L-110 Airport Underground Electrical Duct Banks and Conduits.
6. Pages 486-491 L-120 Temporary Electrical Work and General Electrical Safety Requirements.
7. Pages 492-497 L-125 Installation of Airport Lighting Systems.

III. Replace the following documents with the attached documents outlined below.

1. Drawing No. E-001 – Revised.
2. Drawing No. EL-101-P1 – Revised.
3. Drawing No. EL-102-P2 – Revised.
4. Drawing No. EL-103-P2 – Revised.
5. Drawing No. EL502 – Revised.
6. Drawing No. EL503 – Revised.
7. Drawing No. EL505 – Revised.
8. Drawing No. EL510 – Revised.
9. Drawing No. EL512 – Revised.
10. Drawing No. EL515 – Revised.

IV. Add document L-105 Alterations, Removal, and Demolition.

V. To Respond to Questions.

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1. **Question:** Is it possible to get the CAD files for this project?

Response: The CAD file will be released to the awarded contractor after an electronic release form is signed.

2. **Question:** I am reaching out regarding material testing and inspections for the above-mentioned project, would I be expected to team up with a contractor or will HAS hire the testing laboratory for this project? How do I get involved?

Response: Please refer to Sections 01450 - Contractor's Quality Control, 01455 - City's Acceptance Testing and Item C-100 Contractor Quality Control Program (CQCP).

3. **Question:** Bid Item 111, Bid Schedule A is for 10% Breakage Quantity (Parts) - Reference L-125-3.5. This appears to be for elevated and in-pavement lights only. Please confirm there is no breakage parts for signs.

Response: 10% quantity of breakage parts should be provided for signage as well. A note has been added to sheet E-001 to reflect this update. Please see the revised sheet E-001 in the attachments of this addendum.

4. **Question:** Signs SN05, SN25, SN26, SN36, and SN37 are ILS signs and listed as 2-modules on the sign schedule (EL501). Is there a reason for the signs to be 2-modules? ILS signs are typically just 1-module.

5.

Response: These five signs can be single-module signs depending on the vendor during submittal/construction administration. For the purposes of bidding, please use the quantities provided in the revised bid form attached to this addendum.

6. **Question:** Sign Detail (EL505) lists sign basecans as Class 1B. The L-125 (L-125-3, section 125-2.12) shows the basecans as Class 1A. Since Class 1B is stainless steel, and typically twice the expense of Class 1A (galvanized), does the airport want Class 1B Stainless Steel basecans?

Response: Class 1A base cans are acceptable for sign bases and revisions have been made to the plans attached. All materials to be used on the project shall be reviewed and approved by HAS and the engineer.

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7. **Question:** DBE Goal 11% - Are digital copies of DBE Certificates required to be submitted with the bid?

If so, will you accept Verification of Current DBE Status printed to .pdf from TxDOT Directory located here: <https://txdot.txdotcms.com/>

Response: No, digital copies of DBE Certificates are not required to be submitted with the bid. However, it is a best practice for the prime to provide proof of DBE certification in their bid packet. This practice ensures any sub that will be used for credit is an active DBE certified firm and their NAICS is applicable to the scope of work and listed accordingly. DBE verification can be accessed, and copies printed from the TxDOT Directory located here: <https://txdot.txdotcms.com/>.

8. **Question:** The Bid Form indicates 41 Bid items in the Bid Schedule B – Non-Eligible table. Can you please indicate the plan sheets that these items cover? Please clarify the difference between the Eligible and Non-Eligible bid items.

Response: Volume 2 (Fuel Farm Relocation) is not part of this solicitation and therefore will not be included with the bid documents.

9. **Question:** In the plans Sheet GI101 has a note “Million Air FBO Fuel Farm (to be relocated, see Volume 2)”. Can you please post Volume 2 plan set?

Response: Please refer to the response provided in Question # 8.

10. **Question:** Starting on sheet XS301 the Cross sections provided don't show proposed or existing grade lines. Can you provide updated cross sections?

Response: Cross sections has been updated and attached to this Addendum.

11. **Question:** Please provide drainage excavation and backfill details.

Response: Please refer to P-701 and P-152 for information regarding drainage excavation and backfill.

12. **Question:** Please review the drainage quantities in Schedule A for items 51, 52 and 53.

Response: Please see the attached revised Bid Form provided in the attachments of this addendum.

13. **Question:** Where is the underdrain manholes and cleanouts to be paid for in Schedule A?

Response: Please refer to the response provided in Question # 12.

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14. **Question:** Where is the underdrain “8-IN Non-perforated HDPE Underdrain” to be paid for in Schedule A?

Response: Please refer to the response provided in Question # 12.

15. **Question:** Please review the Underdrain quantities in Schedule A for item 54.

Response: Please refer to the response provided in Question # 12.

16. **Question:** Document 00410A states the offer is open for 90 days. It was mentioned in the pre-bid meeting that offers were to remain open for 180 days. Please clarify.

Response: Offers shall remain open for 180 days. Please see revised 00410A document.

17. **Question:** Sheet CS001 detail 1 shows a “choke stone interlayer”. Specification 307-4.14 states the stone should be ¼” to ½” thick. Is any sort of binder (tack coat) required to stabilize the stone?

Response: No.

18. **Question:** Related to the choke stone question above, is there specifications regarding the installation of the choke stone?

Response: No separate specification. Choke stone is per paragraph 307-2.7 and 307-4.14.

19. **Question:** Sheet GI002, Index of sheets shows a “Volume 2” following sheet XS372 Taxiway Cross Sections. The set we downloaded does not contain any of the Volume 2 sheets shown on the index. Pages numbered 179 through 218 are missing.

Response: Volume 2 (pages 179-218) is not part of this solicitation and therefore will not be included with the bid documents.

20. **Question:** Related to the Volume two question above, after sheet XS372 Taxiway Cross Sections, the file we downloaded from the HAS website has approximately 13 sheets of survey by Landtech.

Response: Volume 2 (pages 179-218) is not part of this solicitation and therefore will not be included with the bid documents.

21. **Question:** Sheet GR102 has 2 bores labeled “B-2”. We think one of these bores should be “B-1” but would like that clarified if possible.

Response: Please refer to the response provided in Question # 8.

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22. **Question:** Reference Specification P-501, paragraph 4.2 Equipment, b (2) “fixed form”, can you specify the maximum area size that would be considered “irregular areas at locations inaccessible to slip-form paving equipment”?

Response: If a slip-form paver cannot be used to pave, this is considered an irregular area.

23. **Question:** Please provide a digital copy of the geotechnical and soils reports referenced in Document 00320 section 4.0.

Response: The selected contractor will be provided the requested report.

24. **Question:** The contract time on Bid Form Part A shows an “18 month after commencement of the Work” period. On sheet GC012 of the plans the overall phasing schedule shows a total of 537 days. With the liquidated damages applied on a per day basis please specify the exact number of contract days allowed for substantial completion.

Response: The project time frame is 18 months. The contractor should schedule inspections for substantial completion/punch list and final completion within that time frame.

25. **Question:** Section 20 “Proposal Requirements and Conditions”, subsection 20-02 Qualifications of bidder’s states that “Each bidder shall submit evidence of competency and evidence of financial responsibility to perform the work to the Owner at the time of bid opening.” In the Prebid the indication was made that this was not a requirement at bid time and that the only documents to be submitted were those listed on Bid Form Part A. If HAS requires this information at bid time, please see the following questions:

Competency = “Evidence of competency, unless otherwise specified, shall consist of statements covering the bidder’s past experience on similar work, and a list of equipment and a list of key personnel that would be available for the work.”

What form and manner would HAS like this submitted?

Response: This requirement is not applicable to invitation to bid (ITB) procurement delivery method.

26. **Question:** Will the contractor be required to supply resumes of key personnel and lists of available equipment?

Response: No.

30. **Question:** Financial - Please confirm Contractors TXDOT prequalification will suffice for the evidence of financial capability? Is there a scoring component to these qualifications as well?

Response: Evidence of financial capability is not required. There is no scoring component in an ITB.

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31. **Question:** If we are placing an open graded permeable CTB (P-307) and a number 89 choke stone as a bond breaker between the CTB and the P-501, will the choke stone layer create a problem of filling the voids in the permeable base? Would a second layer wax cure coat bond breaker be acceptable in lieu of the choke stone? Please clarify the bond breaker requirements for the P-307 to the P-501.

Response: Please see P-307 for choke stone requirements.

33. **Question:** With this project being federally funded and therefore using a DBE requirement can you please clarify the stipulation in Section 00806-6-AIP section 8 that states "Bidders and Contractor are not limited to this register (referring to the City's OBO directory) as a source of DBE subcontractors; however, DBE's must be certified by OBO prior to being eligible." If a subcontractor is certified via the TUCP but isn't certified via the City of Houston specifically will awards to these contractors not count towards the participation goal?

Response: HAS Office of Business Opportunity (OBO) will count DBEs certified by City of Houston (COH) OBO and/or TUCP. Further clarification is as follows: a DBE should be certified by the State of Texas' Unified Certification Program. An eligible firm can apply for certification at the City of Houston or any designated certifying agency within the State of Texas and approved to certify for the TUCP. Bidders and Contractors are not limited to the City of Houston's DBE database located at <https://houston.mwdbe.com/?TN=houston>. Bidders and Contractors can utilize the DBE database located at TxDOT Directory at <https://txdot.txdotcms.com/>.

34. **Question:** The plan sheet CP505 details out multiple scenarios for blockouts on lights as it relates to the proximity to the transverse joints. However, it is unclear the exact location of those lights on the joint layouts. We would like to request an additional pay item for pavement light blockouts by the EACH to help account for the uncertainty in their exact layouts.

Response: Lights requiring blockouts are currently shown on the Electrical Layout sheets EL106-P5 through EL107-P6 with an asterisk next to their number. There are less than 10 in the project. Please account for these costs in your P-501 accordingly.

35. **Question:** The planned typical sections show P-209, however both the P-209 and P-219 specs are listed in the project manual Table of Contents. The P-219 specification is not found within the project manual. Please confirm if P-219 can be used in lieu of P-209 allowing for the use of Crushed Concrete Base course.

Response: P-219 should not be included in the table of contents.

36. **Question:** Will crushed concrete or recycled base or asphalt be allowed for P-307 Cement Treated Permeable Base Course?

Response: If the selected contractor can provide data supporting the recycled material meets the requirements in P-307, this will be evaluated on a specific basis after award.

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37. **Question:** Plan sheets note 68 on sheet GC002 states “Under no circumstances will there be any movement of contractor vehicles and/or equipment across any active airfield pavements at any time unless under escort by HOU Airport Operations.” Will contractor vehicles/equipment and deliveries be under escort by HOU Airport operations or is the contractor responsible for providing escorts?

Response: The Contractor's movement qualified escort drivers will be responsible unless it requires crossing an open runway. In that case HOU Airport Operations (AOps) shall provide escort.

38. **Question:** Sheet GC012 in the legend refers to a “Phase 7 (see Sheets GC701 Volume 2)”. In the plan set provided there is no Sheet GC701 or any other reference to work to be completed in Phase 7. Please provide the applicable drawings and details to Phase 7 work and the referenced “Volume 2” or clarify what the intent of that is to be.

Response: Please refer to the response provided in Question # 8.

39. **Question:** There appears to be several apparent discrepancies with the bore logs. (See below for a few examples) These bore logs are relied upon to help us calculate volumes and tonnages of materials to be demolished and removed. Please confirm the labeling and accuracy of the bore logs.
- a. B-14 shows to be in the middle of the new taxiway connector E. On google earth it appears that area was demolished and removed sometime in 2022. But the bore log is showing 12.25” concrete over 14” of base.
 - b. Bore log 23 shows just soils however that bore log layout shows that to be in the middle of Taxiway Connector D.

Response: Revised sheets were issued in Addendum 3 dated March 28, 2023.

40. **Question:** In regard to the earthwork quantities: Can you confirm that the earthwork (excavation and embankment qty's) does not include the volume of materials outlined to be removed in the demolition qty's?

Response: Demo quantities are included in their respective pay items (P-101), excavation is included with the P-152 pay items.

41. **Question:** Regarding the earthwork quantities: We believe an embankment item is required to be added in the Bid Schedule A section as well. In many areas we are removing existing taxiway connectors and the new connectors will not be reconstructed in the same location. This demo process then will create a hole and, in these areas, what is the mechanism for payment in order to bring those areas back up to planned grades? This will require fill embankment to be placed to bring back up to grade.

Response: This is a cut job. Cut and fill (including backfill for the demoed taxiways) is all part of unclassified excavation P-152. 4" of topsoil is accounted for under T-905, therefore finished grade off-pavement numbers are to 4" below FG

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42. **Question:** Reference Article 7 “Enumeration of Contract Documents” Page 00520-4: The bid documents contain multiple contract documents including the Agreement, the City of Houston Conditions of the Contract, FAA General Provisions, FAA Non-Standard Taxiways Supplementary Conditions, Supplementary Conditions for Projects Funded by AIP Grant, etc. These documents cover the same subject matter (i.e., insurance, DBE requirements, compensable and non-compensable events, etc.) but there is not a clear order of precedence in the event of a conflict. Please provide an order of precedence of the Contract Documents referenced in Article 7 of the Agreement.

Response: In the event of a conflict, contract documents mentioned in Article 7, Document 00520-4 precede other documents in the solicitation.

43. **Question:** Reference Article 7 “Enumeration of Contract Documents” Page 00520-4: The term "Contract Documents" is not defined. Should bidder assume the documents listed in Article 7 constitute the defined term "Contract Documents?"

Response: The bidder should be focusing on the documents to be submitted with their bid as mentioned in Document 00410-A1. Article 7 “Enumeration of Contract Documents” is for the successful bidder only.

44. **Question:** Reference City of Houston Conditions of the Contract; FAA Non-Standard Supplementary Conditions; Supplementary Conditions for Project Funded by AIP Grant Section 3.5.3: Section 3.5.3 of the Supplementary Conditions for Project Funded by AIP Grant replaces Section 3.5.3 of the City of Houston Conditions of the Contract. Does this also delete Sections 3.5.3.1, 3.5.3.2, 3.5.3.2.2, 3.5.3.3 of the City of Houston Conditions of the Contract?

Response: The requirements that govern this project are DBE as stipulated in 49 CFR Part.

45. **Question:** Reference City of Houston Conditions of the Contract; FAA Non-Standard Supplementary Conditions; Supplementary Conditions for Project Funded by AIP Grant Section 3.5.3: Section 3.5.3.3 of the City of Houston Conditions of the Contract requires the Contractor to meet the stated DBE Goal on a YEARLY basis. However, Section 3.5.3 of the Supplementary Conditions for Project Funded by AIP Grant appears to replace the City's requirements (i.e. Sections 3.5.3.1, 3.5.3.2, 3.5.3.2.2, 3.5.3.3) and instead implements the federal DBE Program under 49 CFR Part 26. In addition, the FAA Non-Standard Supplementary Conditions adds new DBE provisions under newly created Sections 3.5.3.1.1, 3.5.3.1.2, 3.5.3.1.3. Please clarify which DBE Program rules will govern this project. Please also clarify which sections in these various Contract Documents will apply to this Project.

Response: Please refer to the response provided in Question # 44.

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46. **Question:** Section 11.2.3 of the City of Houston Conditions of the Contract states: “Contractor shall furnish to the Director current certificates of insurance, endorsements, all policies, or to the policy documents evidencing adequate coverage, as necessary.” Contractor is a privately held company and has more than one entity insured under their insurance program. Please confirm the Contractor can make copies of their insurance policies available for review in a mutually agreeable location or allow for the redaction of any privileged/confidential information not related to the project.

Response: Confirmed.

47. **Question:** Section 11.2.23 of the City of Houston Conditions of the Contract states: “Contractor shall require Subcontractors and Suppliers to obtain Commercial General Liability, Workers’ Compensation, Employer’s Liability and Automobile Liability coverage that meets all the requirements of Paragraph 11.2.” The Supplementary Conditions contain a new Table 1 which replaced the Table 1 in the City of Houston Conditions of the Contract. The New Table 1 contained in the Supplementary Conditions requires additional coverages including Owner’s and Contractor’s Protective Liability, Installation Floater, and increased Automobile and increased Excess Limits. These additional coverages are not expressly stated as required of any Subcontractors or Suppliers in Section 11.2.23 of the City of Houston Conditions of the Contract. Please clarify whether Subcontractors and Suppliers are required to provide the coverages in Table 1 of the Supplementary Conditions.

Response: Subcontractors and Suppliers are not required to provide the coverages in Table 1 of the Supplementary Conditions.

48. **Question:** Reference Section 00800: The Supplementary Conditions contain a new Table 1 which replaced the Table 1 in the City of Houston Conditions of the Contract. The New Table 1 contained in the Supplementary Conditions requires additional coverages including Owner’s and Contractor’s Protective Liability, Installation Floater, and increased Automobile and increased Excess Limits. These additional coverages are not expressly stated as required of any Subcontractors or Suppliers in Section 11.2.23 of the City of Houston Conditions of the Contract. If Subcontractors and Suppliers are required to provide the coverages in Table 1 of the Supplementary Conditions, will any exceptions be made if they cannot obtain the required coverages or limits?

Response: Please refer to the response provided in Question # 47.

49. **Question:** Reference Section 00800: Can the Contractor satisfy the Installation Floater required by Table 1 in Article 11 of the Supplementary Conditions with the Builders’ Risk Policy required by Table 2 of the Supplementary Conditions?

Response: No, they are different in terms of application and policy.

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50. **Question:** Please confirm that the increased limit of \$10,000,000 required by Table 1 in the Supplementary Conditions is only required by the Contractor and not the Subcontractors and Suppliers.

Response: Confirmed.

51. **Question:** Please confirm that Contractor can meet the increased limit of \$10,000,000 required by Table 1 in the Supplementary Conditions with the combination of Umbrella and Excess policies.

Response: No.

52. **Question:** Please confirm that this project is outside the 100-year floodplain and Flood Hazard Insurance coverage is not required.

Response: Please refer to Section 00800.

53. **Question:** Due to recent market conditions, Builders Risk limits for the full Contract Amount may not be commercially available for catastrophe perils (i.e., flood). Please confirm a sublimit for catastrophe perils in the Builders Risk Insurance would be acceptable to the Owner.

Response: Please refer to the response provided in Question # 52.

54. **Question:** The Header in Table 2 of the Supplementary Conditions contains the phrase “Defense Costs Excluded from Face Amount of Policy.” However, a Builder’s Risk policy is a property policy covering work during construction of the project. Please confirm that the Defense Costs Excluded from Face Amount of Policy is not required for the Builder’s Risk Policy.

Response: Please refer to the response provided in Question # 52.

55. **Question:** Table 2 of the Supplementary Conditions requires coverage for time element coverage, soft costs (management, architecture, financial costs, pre-opening costs, etc.). These coverages are generally added to a Builder’s Risk policy via endorsement with a separate limit. Please provide a limit that would be acceptable to Owner.

Response: Please refer to the response provided in Question # 52.

56. **Question:** The Header in Table 2 of the Supplementary Conditions contains the phrase “Defense Costs Excluded from Face Amount of Policy. However, a Contractor’s Pollution Liability policy with defense cost outside the limits is not commercially available. Defense costs will be equal to or less than the policy limits. Please remove this requirement or provide an alternative limit of insurance.

Response: Please refer to the response provided in Question # 52.

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57. **Question:** In Section 11.3.1 of the City of Houston Conditions of the Contract it states: "Contractor shall furnish City Engineer with certified copies of Contractor's actual insurance policies." Contractor is a privately held company and has more than one entity insured under their insurance program. Please confirm the Contractor can make certified copies of their insurance policies available for review in a mutually agreeable location or allow for the redaction of any privileged/confidential information not related to the project.

Response: Please refer to Section 11.3.1.

58. **Question:** What are the material properties required for embankment?

Response: Refer to P-152 for requirements around embankment material.

59. **Question:** How will liquidated damages be assessed with project duration being 18 months?

Response: Document 00800, item 9.12.1.1, specifies the liquidated damages per day.

60. **Question:** Will liquidated damages be assessed by calendar day or working day?

Response: Liquidate Damages are computed on a calendar day basis.

61. **Question:** Are there interim milestones?

Response: Milestones will be developed with the selected contractor.

62. **Question:** What is the engineer's estimate?

Response: The engineer's estimate is not available.

63. **Question:** What is the anticipated award date?

Response: Anticipated award date is August 2, 2023.

64. **Question:** May bidders re-create the bid form to be submitted?

Response: No.

65. **Question:** Will an owner's field office be required?

Response: An owner's field office is not required.

66. **Question:** What is the warranty period?

Response: Refer to the contract section 3.0 - Requirement of Bidders.

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69. **Question:** Regarding the Centerpoint Allowance, provide scope definition and value.

Response: The CenterPoint Allowance has been removed and will not be apart of this solicitation. Please see the revised Bid Form attached to this addendum.

70. **Question:** Phases 5 and 6 work restriction periods are indicated on plan sheet GC012, will these periods be dependent of the project schedule progress, or are they based on hard dates dictated by airport operations?

Response: Phases 5 and 6 can only happen between the dates of May 1 to Sept 30. Runway 4-22 and associated SMGS taxiways cannot be closed outside of those dates. Phase flexibility within those windows can be accommodated and will be evaluated when presented.

71. **Question:** Letters of Intent will be provided for each participating DBE firm. With the anticipation of some adjustments leading up to the bid due date, can the Letters of Intent be submitted without signature?

Response: No, Primes must obtain Letter of Intent signatures from the identified DBE prior to bid submission.

72. **Question:** Can construction phases run concurrently? We see locations where more than one phase could be constructed simultaneously without affecting airport operations, (i.e. keyed note 1 on sheet GC501-P5 "CONTRACTOR SHALL, AT A MINIMUM, COMPLETE WORK WITHIN THE PHASE LIMITS SHOWN FOR THIS PHASE. DURING THE SPECIFIED TIME FRAME, THE CONTRACTOR MAY ALSO BEGIN PHASE 6A WORK UP TO, BUT NOT PAST, THE EXISTING TAXIWAY K TOFA AS SHOWN IN THE PHASE 5 BUFFER AREA....").

Response: Runway 4-22 and associated SMGS taxiways can only be closed between May 1 and Sept 30. Runway 13L-31R and 13R-31L cannot be closed at the same time. Changes to the phasing shown in the plans can be evaluated but the closure to Runway 4-22 and associated SMGS taxiways are only allowed during the non-restricted period.

73. **Question:** How many concrete batch plants are required for the project?

Response: Contractor to determine this based on production rate and schedule.

74. **Question:** Will the two (2) Contractor Staging Areas (North and South) Concrete Batch Plant sites have water sources?

Response: No water will be supplied by HAS. A site investigation will be conducted to locate nearest fire hydrant that contractor could utilize with a meter.

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75. **Question:** Will TxDOT DBE Certification under the USDOT Unified Certification Program (UCP) be accepted for the project DBE goal requirement?

Response: Yes, please ensure the DBE firm has an applicable NAICS that correlates to the scope of work that they will perform on the project.

76. **Question:** Is it permitted to produce precast concrete utility structures at Contractor Staging Areas?

Response: Contractor will be required to coordinate equipment with HAS Project Manager to ensure precast equipment does not require modifications to 7460s. Regardless of where the precast structures are produced, the structures must comply with the ASTM standards for precast structures as outlined in the project manual. If the contractor decides to proceed with this approach final approval will need to be provided by the HAS Project Manager.

77. **Question:** In lieu of exothermically welding the light base rebar cages together, will it be permissible for the contractor to utilize metal tie wire to assemble the rebar cages?

Response: This is acceptable practice to use metal tie wire to assemble the rebar cages, but this question should be submitted as an RFI and will be evaluated at that time.

78. **Question:** The Airfield Electrical Phasing Plans, Drawing's E-101 thru E-106, identify L-858 Guidance Signs that will require temporary blank panels during construction. Are these the only signs that will require blank panels?

Response: The plans provided attempt to convey the locations where blank panels are known to be required. Additional panels are added in this addendum, and a handful of additional blank panels are always worth having on hand.

79. **Question:** There is no definitive or accurate way to calculate the total cost for this specification section. In an 18-month time frame, the contractor could be called back to the project site an infinite number of times. Could a line item be added to the Bid Schedule, on a per each basis, to cover the cost of being called back to the project site for unscheduled events?

Response: The specifications remain as is.

80. **Question:** Details on Drawings EL504 thru EL508 reference using Copper Clad Ground Rods. Spec. Section L-108-2.3 and Drawing EL503, Detail 2 calls for Copper Ground Rods. Please clarify which type of ground rods the contractor is to use?

Response: FAA specifications rule this decision; ground rods shall be copper-clad in accordance with L-108-2.3. Related EL-series drawings have been revised and attached to this addendum.

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81. **Question:** Specification Section L-110-3.2 calls for 3" spacing between conduits in duct banks. Drawing EL510, Details 5, 6 & 9 shows 2" spacing. Is the contractor to install the duct banks per the dimensional detail drawings?

Response: We will hold 2" for spacing between conduits, however, 3" will be required externally to edge of sand/concrete envelope.

82. **Question:** Multiple recent HAS projects involving installation of L-868B base cans required the contractor to furnish two-piece bases with multi-hole adapter top sections. Please confirm if the contractor is to furnish standard L-868B, Class 1A one-piece base cans or L-868B, Class 1A two-piece, multi-hole adapter base cans?

Response: No two-piece cans required.

83. **Question:** Is the contractor required to reinforce the 1-Way, 2" concrete encased duct bank in the shoulder pavement?

Response: No, reinforcing is only required under full strength pavement.

84. **Question:** What is the Scope of Work and Method of Measurement for Bid Schedule B - Non Eligible Line Item 40 "New Equipment" and Line Item 41 "Centerpoint Service Allowance"

Response: Please refer to the response provided in Question # 8.

85. **Question:** Referencing Line-Item No. 111 "10% Breakage Quantity (Parts): A) Does the 10% quantity cover just the various fixture types or are isolation transformers & L-858 LED power supplies and light engines to be included? B) If a fixture quantity (i.e. L-804) is less than 10, is the contractor still required to supply a spare?

Response: 10% spare quantity shall include light engines, isolation transformers, any vendor-specific integral sign power components. Any fixture that is provided, if less than 10, shall have a spare provided as well. Additional information on this item will be provided on E-001 in an addendum.

86. **Question:** Is all of the electrical demolition work to be paid for under Bid Schedule B - Non-Eligible, Line Item 39?

Response: Electrical Demolition shall be paid under this addendum-issued L-105 specification and pay items associated.

87. **Question:** What line item pays for installation of the 1/O AWG bare guard wire above the FAA duct banks?

Response: A line item was added with the footage required for 1/O guard wire in Addendum #1 (L-108-5.8).

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88. **Question:** What line item pays for installation of the 2" Drain Lines?

Response: A pay item has been provided in the attached revised D-705 specification.

89. **Question:** The typical L867B base can detail on Drawing. EL512 shows #2 AWG solid copper counterpoise wire. Please confirm if this wire is a #6 solid BSDC?

Response: Yes, this #2 has been updated to be #6 in the attached revised EL512 Drawing.

90. **Question:** Communications hand hole #305 is denoted on the drawing with a manhole symbol. Please confirm that this structure is actually a hand hole.

Response: The plans have been updated to show as a hand hole. Please see attachment.

91. **Question:** A note of Drawing EL107-P6 is instructing the contractor to install the new CommHH #320 into an existing communications ductbank. Is communications cabling currently installed in the existing ductbank?

Response: FAA is unsure of contents in this area; it is believed that there is a copper 50-pair communications cable running between the 4 GSA and the 22 Localizer somewhere in this area.

92. **Question:** If communications cable is present, is it active?

Response: It is unknown if it is active, however, it is believed to be active.

93. **Question:** What type of communications cable is in the existing ductbank?

Response: It is believed to be a 50-pair communications copper.

94. **Question:** Where does the communications cable originate and end?

Response: It may run between the 4 GSA and 22 Localizer.

95. **Question:** Will the contractor be responsible for removing and/or replacement of any existing communications cabling?

Response: The contractor will coordinate the reconnaissance of the cabling in this area with FAA per the L-120 specification. If the duct is able to remain without interruption during construction and demolition of the Taxiway K1 connector(s), then the communications ductbank will be installed as a spare crossing. If the cable exists, is active, and will be interrupted by construction, then the contractor will be responsible to price and provide a new cable run meeting FAA's specifications via a Change Order in the field.

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96. **Question:** Note 8 on Drawing. EL101-P1 references 4" minimum PVC drainpipe routed from the manholes/hand holes to the nearest catch basin. Electrical Legend Drawing. E-001 & Electrical Details Drawing. EL510, Detail 3 calls for a 2" PVC Drain. Please confirm the correct drain size pipe?

Response: 2" Minimum drainage pipe size. EL101-P1 has been updated accordingly. Please see revised attachment.

97. **Question:** Section P-501-4.18 Opening to Construction Traffic states that construction traffic can be opened once the flexural strength has attained 450 psi. However, section 501-4.17 Protection of pavement states "In paving intermediate lanes between newly paved pilot lanes, operation of the hauling and paving equipment will be permitted on the new pavement after the pavement has been cured for seven (7) days, the joints are protected, the concrete has attained a minimum field cured flexural strength of 450 psi, and the slab edge is protected." With regards to the 7-day cure and the 450 psi requirements, for paving infill lanes please clarify will the contractor be held to both the 7 day AND the 450 psi or can the 450-psi flexural requirement as outlined in the Opening to construction traffic requirement be the governing factor in paving infill lanes?

Response: P-501-4.17 and the requirements for 7 days and 450psi govern for paving infill lanes.

98. **Question:** Per section 501-4.10 d.3.c "Joints in Hardened Concrete" states "The concrete shall have cured for seven (7) days or reached a minimum flexural strength of 450 psi before drilling begins." Please confirm that drilling for dowel bars can begin when either of the 2 requirements outlined above are attained (7 days or 450 psi).

Response: Per P-501-4.10.d.3.c the requirement is 7 days or 450 psi.

99. **Question:** With regards to the water cement ratio on the P-307 Permeable CTB the mix design requirements outline a .36. From our experience a max water cement ratio of .5 works best for this material. Please consider revising the WCR for the P-307 to a max of .5.

Response: For bidding purposes, the specifications remain as is. If the awarded contractor would like to submit a RFI after award, this will be evaluated accordingly.

100. **Question:** Section P-307-4.11 Curing states "The completed drainage layer shall be moist cured for a period of twelve hours followed by application of an impervious membrane curing compound in accordance with paragraph 307-2.6." In lieu of the moist curing for 12 hours, can the contractor immediately place a curing compound instead?

Response: Please refer to the response provided in Question # 99.

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101. **Question:** P-307-2.1 Indicates a #67 or a #57 aggregate can be used. P-307-3.1 indicates a #57 aggregate with the use of a Fine Aggregate as well. Please clarify the aggregate and mix design requirements.

Response: Please follow the mix design requirements as shown in the table of P-307-3.1.

102. **Question:** Sheet CS001 Pavement Typical Sections shows a Filter fabric between the P-307 and the P-209 layers. Please confirm that this filter fabric can be driven on during placement of the P-307 layer.

Response: See Section P-209-3.7.

103. **Question:** Bid Item 72, No. 6 AWG Counterpoise Wire has enough to cover ductbank items 74-76. Please increase quantity to provide counterpoise for bid item 77, 440' of 84W2".

Response: The Bid Form has been updated and attached to this addendum.

104. **Question:** No bid item is provided for 2W4" FAA ductbank. Please advise. For 2W4" FAA ductbank, is 1/C #1/0 AWG bare guard wire incidental, or shall it have its own bid item?

Response: Coordination with FAA has been ongoing; updated line items associated with the FAA Duct and guard wire has been provided in this addendum.

105. **Question:** Please verify if 2" PVC drain line for electrical structure is incidental to bid item 74.

Response: A pay item will be provided in the D-705 specification for the 2" PVC drain line.

106. **Question:** See sheet EL510, detail 8. Is rebar reinforcement required for all ductbanks? If not, please specify which ductbanks this detail shall be applicable to.

Response: Reinforcing is required of any ductbanks that cross under full strength pavement and shall extend 5' beyond the edge of pavement per EL510. See updated General Note 5 on sheet E-001.

107. **Question:** See sheet EL502, detail 3. Please verify if this is incidental to a bid item and clarify which one.

Response: The conduit to basecan tie-in cost shall be incidental to associated conduit installation; L-110-5.1 or L-110-5.2.

108. **Question:** See Schedule B, bid item 40. Please clarify what work shall be incidental to this item.

Response: Bid item 40 is not part of this solicitation and therefore has been removed from the bid documents.

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109. **Question:** See Schedule B, bid item 41. Please clarify what work shall be incidental to this item.

Response: Bid item 41 is not part of this solicitation and therefore has been removed from the bid documents.

110. **Question:** See sheet EL510, detail 9. Was this meant to be used for bid item 77, 8W2"?

Response: Yes, please see updated EL510 attached to this addendum.

111. **Question:** See sheet EL510, detail 6. Was this meant to be used for bid item 76, 4W2"?

Response: Yes, please see updated EL510 attached to this addendum.

112. **Question:** See bid form. Bid item 40 and 41 reference sheet numbers E101 and E700. These sheets are not included in the plans. Please advise.

Response: Please refer to the response provided in Question #s 108 and 109.

113. **Question:** Will the airport provide any locations on the airport to dispose of excess excavated soil?

Response: No, please dispose of it per the specifications.

114. **Question:** What is the thickness of the concrete for the panel replacement bid item?

Response: Please see detail 4 on CS001.

115. **Question:** Will HAS consider changing joint types for the 16" concrete pavement, such as changing a Type C joint to Type E joint in order to accommodate slipform paving in some areas?

Response: Contractor shall submit paving plan for review and approval.

116. **Question:** At the pre-bid a caller on the virtual meeting made a statement that if a bidder does not have airport experience, they would probably not be considered responsive. With that reasoning the City will only have the same companies bidding. How does that generate competition? My question is - how do we get the airport experience? As a company and as individuals we have installed hundreds of thousands of square yards of pavement. Does any of that count?

Response: The requirements remain as-is.

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117. **Question:** Does HAS have a bid bond form that we are required to use, or can we submit one that our surety generates?

Response: HAS does not have a bid bond form. You may submit one that the surety generates.

118. **Question:** What address does the bid need to be delivered to?

Response: Please deliver to City Secretary's Office, City of Houston City Hall Annex, 900 Bagby Street, Room P101, Public Level , Houston TX 77002

119. **Question:** Will the owner allow P-219 to be used on this project as a replacement of the P-209 in the proposed sections?

Response: P-219 should not be included in the table of contents. Please submit the bid per plans and specifications as advertised.

120. **Question:** Is Volume Two plans for Bid Schedule B? If so, have the Volume Two plans been release?

Response: Please refer to the response provided in Question # 8.

121. **Question:** Please confirm the quantity of #4 epoxy coated rings to be used with the L-868B base can assemblies in PCC Pavement? The various details and/or notes on Drawings EL508 thru EL510 denote quantities of 3, 4 & 5 rings per rebar cage.

Response: The epoxy coated rings shall be placed in 6" intervals vertically with a minimum of 3.

122. **Question:** Part 501-4.2.b (1) states "Slip-form. The standard method of constructing concrete pavements shall be with an approved slip-form paving equipment...", alternatively, would it be permissible to use a form riding paver and stationary side forms in lieu of slip-form paving equipment?

Response: Please follow the specifications.

123. **Question:** Will a pay item be provided for the FAA 2 Way 4" Schedule 40 PVC duct bank with #1/0 AWG Bare Counterpoise Wire? (EL102-P2)

Response: Coordination with FAA has been ongoing; updated line items associated with the FAA Duct and guard wire has been provided with this addendum.

124. **Question:** Will a pay item be provided for electrical demolition?

Response: Electrical Demolition shall be paid under the addendum-issued L-105 specification and pay items associated.

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124. **Question:** Will a pay item be provided for 2" PVC drain line for electrical structure?

Response: A pay item will be provided in the D-705 specification for the 2" PVC drain line.

125. **Question:** There appears to be a large discrepancy in the bid quantity of 440 linear feet vs. a takeoff quantity of 2260 linear feet for the 8-way 2" Concrete Encased Electrical Duct. Please compare and let us know how much we should expect to install based on the installation drawings.

Response: Please see the attached revised Bid Form provided in the attachments of this addendum.

126. **Question:** Is water and/or 3 phase electricity available at either of the staging areas? (GC011).

Response: No water will be supplied by HAS. A site investigation will be conducted to locate the nearest fire hydrant that the contractor could utilize with a meter. Contractor is to run temporary power and coordinate with CenterPoint for connection at Contractor's expense.

127. **Question:** Will a manhole detail be provided or should the contractor use the handhole detail on EL506 with the note 1 stating the dimensions applied?

Response: Yes, contractor should use the dimensions provided and refer to note 3 calling for a Texas PE for precast concrete structure to meet the aircraft rating required.

128. **Question:** Will contractor be required to participate in an Owner Controlled Insurance Program for this project? (Insurance requirements shown on PDF p. 123 and p. 179 of specs)?

Response: Refer to C-100 Contractor Quality Control Specification.

129. **Question:** Will Builders Risk insurance be required for this project? (p. 180 of specs).

Response: Please refer to the response provided in Question # 128.

130. **Question:** See bid item 120, Install MALSR Light Bar (5 EMT-Mounted Lights). Please confirm that quantity is to be 2 LS.

Response: This line item should have a quantity of 1. Please see the attached revised Bid Form provided in the attachments of this addendum.

131. **Question:** Item 25 "Abandon Existing Storm Pipe" of 242 LF. Where is this located on the plans?

Response: See sheet CD105-P4.

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132. **Question:** Per Addendum 3 – Items 54, 55, 56, 57 and 58 have been added or revised. Can you release the revised sheets showing these changes?

Response: Original bid tab incorrectly omitted those items, nothing has changed on the sheets.

133. **Question:** Per Addendum 3 – Items 54, 55, 56, 57 and 58 have been added or revised. Can you release the revised sheets showing these changes?

Response: Please refer to the response provided in Question # 132.

134. **Question:** Per Addendum 3 – Items 51, 52 and 53 quantities were revised. Can you release the revised sheets showing these changes?

Response: Please refer to the response provided in Question # 132.

135. **Question:** Item 28 “Unclassified excavation” has a quantity of 119,713 CY. Can you review this quantity?

Response: Verified.

136. **Question:** Item 29 “Unsuitable Excavation” of 10,000 CY. Where is this located on the plans?

Response: Unsuitable is an assumed quantity for determination in the field by the contractor and the Resident Project Representative (RPR).

137. **Question:** Is there a bid item for the FAA handholes?

Response: Please replace item L-110-5.5 to read 'FAA Handhole' with a quantity of 7. The communications manhole line item can be removed.

138. **Question:** Is there a detail for bid item 90, Electrical Manhole?

Response: Please see the dimensions provided in the notes on sheet EL506 and refer to note 3 calling for a Texas PE for precast concrete structure to meet the aircraft rating required.

139. **Question:** Please clarify what is included in bid item 94, Communications Manhole with a quantity of " - ".

Response: This item has been updated on the Bid Form. Please see the attachment in this addendum.

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140. **Question:** E-001, North Vault Circuit Legend indicates that there are two wires per circuit. Based off that, there is a substantial overrun on the cable. Please advise.

Response: Based on available circuit information, we are holding two conductors running in conduits until L-120 investigation is completed. A re-check of the cable quantities has provided a total of 180,000LF required. The bid form has been updated and attached to this addendum.

141. **Question:** I realize this is after the deadline for questions. We cannot find any ABANDON EXISTING STORM PIPE on the plan sheets. The bid quantity for this is 431 LF. Our takeoff for REMOVE STORM DRAINAGE LINE 12-IN TO 36-IN DIAMETER is 2,416 LF and the bid quantity is 1,428 LF. Could some of the pipe shown for removal actually need to be abandoned in place?

Response: Please see sheet CD105-P4.

142. **Question:** Can you confirm that the specifications are correct for Bid Item# 40 (P401-8.2) Asphalt Base Course – 495 Tons and Bid Item 41 (P-403-8.1) Asphalt Mixture Surface Course. I think Bid Item 40 should be specification P-403 – Asphalt Mix Pavement Base Leveling Course and Bid Item 41 should be specification P-401 – Asphalt Mix Pavement Surface Course. Can you please verify that the specifications for these two bid items are correct.

Response: Item #40 is correct as shown P410-8.2 Asphalt Base Course per detail 4 on CS002.

When issued, Addendum shall automatically become part of the solicitation documents and shall supersede any previous specification(s) and/or provision(s) in conflict with the Addendum. Addendum will be incorporated into the Agreement as applicable. It is the responsibility of the bidder(s) to ensure that it has obtained all such letter(s). By submitting a bid on this project, bidder(s) shall be deemed to have received all Addendum and to have incorporated them into their bid.

If further clarification is needed regarding this solicitation, please contact Senior Procurement Specialist, David Martinez via email at david.martinez@houstontx.gov.

DocuSigned by:

Cathy Vander Plaats

02232028DE99414...

Cathy Vander Plaats
Aviation Procurement Officer
Houston Airport System

CVP/dm

cc: Alfredo Oracion
Dallas Evans
Solicitation File

April 18, 2023

FAA Non-Standard Taxiways at William P. Hobby Airport

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Attachments:

1. Document 00410A Bid Form – Part A.
2. Document 00410B Bid Form – Part B.
3. D-705 Pipe Underdrains for Airports.
4. L-108 Underground Power Cable for Airports.
5. L-110 Airport Underground Electrical Duct Banks and Conduits.
6. L-120 Temporary Electrical Work and General Electrical Safety Requirements.
7. L-125 Installation of Airport Lighting Systems.
8. Drawing No. E-001 – Revised.
9. Drawing No. EL-101-P1 – Revised.
10. Drawing No. EL-102-P2 – Revised.
11. Drawing No. EL-103-P2 – Revised.
12. Drawing No. EL502 – Revised.
13. Drawing No. EL503 – Revised.
14. Drawing No. EL505 – Revised.
15. Drawing No. EL510 – Revised.
16. Drawing No. EL512 – Revised.
17. Drawing No. EL515 – Revised.
18. L-105 Alterations, Removal, and Demolition.

FAA Non-Standard Taxiway
HAS No. 770

**BID FORM
PART A**

Document 00410A

BID FORM – PART A

To: **The Honorable Mayor and City Council of the City of Houston
City Hall Annex
900 Bagby Street
Houston, Texas 77002**

Project: FAA Non-Standard Taxiways and Fuel Farm Relocation Project

Project No.: HAS No. 770

Bidder: _____

(Print or type full name of business entity, such as corporation, LLC, etc)

1.0 OFFER

- A. Total Bid Price:** Having examined the Project location and all matters referred to in Bid Documents for the Project, we, the undersigned, offer to enter into a Contract to perform the Work for the Total Bid Price shown on the signature page of this Document.
- B. Security Deposit:** Included with the Bid is a Security Deposit in the amount of 10 percent of the Total Bid Price subject to terms described in Document 00200 – Instructions to Bidders.
- C. Period for Bid Acceptance:** This offer is open to acceptance and is irrevocable for 180 days from Bid Date. That period may be extended by mutual written agreement of the City and Bidder.
- D. Addenda:** All Addenda have been received. Modifications to Bid Documents have been considered and all related costs are included in the Total Bid Price.
- E. Bid Supplements:** The following documents are attached:
- Security Deposit (*as defined in Document 00200 – Instructions to Bidders*)
 - Document 00450 – Bidder's Statement of MWSBE Status
 - Document 00454 – Affidavit of Non-interest
 - Document 00455 – Ownership Information Form
 - Document 00456 – Bidder's Certificate of Compliance with Buy American Program (*required for AIP funded project*)
 - Document 00457 – Conflicts of Interest Questionnaire (CIQ)
 - Document 00458 – Bidder's Certificate Regarding Foreign Trade Restriction (*required for AIP funded project*)
 - Document 00459 – Contractor's Statement Regarding Previous Contracts Subject to EEO (*required for AIP funded project*)
 - Document 00460 – Pay or Play Acknowledgement Form (POP 1-A)
 - Document 00470D - Bidder's DBE Participation Plan (required for AIP funded project)
 - Document 00480 – Form SCM-1 Reference Verification
 - Document 00481 – Non-Collusion Statement
 - Document 00842 – Letter of Intent*
 - Others as listed: _____

00410-A1

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ISSUED FOR BID
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BID FORM
PART A

2.0 CONTRACT TIME

- A.** If offer is accepted, Contractor shall achieve Date of Substantial Completion within 18 MONTHS after Date of Commencement of the Work, subject to adjustments of Contract Time as provided in the Contract.

«FAA Non-Standard Taxiway»
WBS No. «HAS No. 770»

BID FORM**PART B**

Document 00410B

BID FORM – PART B

1.0 TOTAL BID PRICE HAS BEEN CALCULATED BY BIDDER, USING THE FOLLOWING COMPONENT PRICES AND PROCESS (PRINT OR TYPE NUMERICAL AMOUNTS):

A. BASE UNIT PRICE TABLE:

Bid Schedule A - Eligible

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
1	01410	TPDES Requirements	LS	1		
2	01505	Temporary Facilities and Controls	LS	1		
3	01555 - 1.04A	Traffic Control and Regulation (Excluding Flaggers)	LS	1		
4	01555 - 1.04B	Flaggers	LS	1		
5	C-100	Contractor Quality Control Program (CQCP)	LS	1		
6	C-102-5.1	Temporary Erosion Control	LS	1		
7	C-105-6.1	Mobilization (Max 5% of Total Bid)	LS	1		
8	P-101-5.1	Pavement Removal - Asphalt Pavement (Less than 3-in)	SY	18,186		
9	P-101-5.2	Pavement Removal - Asphalt Pavement (3-in to 6-in)	SY	21,536		
10	P-101-5.3	Pavement Removal - Asphalt Pavement (6-in to 10-in)	SY	2,531		
11	P-101-5.4	Pavement Removal - Asphalt Pavement (10-in to 20-in)	SY	2,520		
12	P-101-5.5	Pavement Removal - Concrete Pavement (10-in to 15-in)	SY	19,919		
13	P-101-5.6	Pavement Removal - Concrete Pavement (15-in to 20-in)	SY	36,141		
14	P-101-5.7	Cement Treated Base Removal (5-in to 10-in)	SY	27,122		

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Bidder's Initials []

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BID FORM

WBS No. «HAS No. 770»

PART B**Bid Schedule A - Eligible**

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
15	P-101-5.8	Cement Treated Base Removal (10-in to 15-in)	SY	25,935		
16	P-101-5.9	Cement Treated Base Removal (15-in to 20-in)	SY	6,132		
17	P-101-5.10	Cement Treated Base Removal (20-in to 30-in)	SY	2,531		
18	P-101-5.11	Econcrete Base Removal (10-in to 20-in)	SY	1,628		
19	P-101-5.12	Cold Milling (Variable Depth)	SY	2,300		
20	P-101-5.13	Miscellaneous Concrete Pad Removal	SY	334		
21	P-101-5.14	Remove Storm Drainage Line 12-in to 36-in Diameter	LF	1,428		
22	P-101-5.15	Remove Storm Drainage Line 42-in Diameter and Greater	LF	777		
23	P-101-5.16	Remove Trench Drain	LF	242		
24	P-101-5.17	Remove Storm Drainage Structure	EA	13		
25	P-101-5.18	Abandon Existing Storm Pipe	LF	431		
26	P-101-5.19	Remove Existing Headwall	EA	3		
27	P-151-4.1	Clearing and Grubbing	LS	1		
28	P-152-4.1	Unclassified Excavation	CY	119,713		
29	P-152-4.2	Unsuitable Excavation	CY	10,000		
30	P-155-8.1	Lime-Treated Subgrade (6-in)	SY	2,762		
31	P-155-8.2	Lime-Treated Subgrade (12-in)	SY	68,660		
32	P-155-8.3	Lime	TON	4,301		
33	P-209-5.1	Crushed Aggregate Base Course (6-in)	SY	2,762		
34	P-209-5.2	Crushed Aggregate Base Course (8-in)	SY	58,485		
35	P-209-5.3	Crushed Aggregate Base Course (15.5-in)	SY	231		

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BID FORM

PART B

Bid Schedule A - Eligible

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
36	P-209-5.4	Crushed Aggregate Base Course (26-in)	SY	8,390		
37	P-209-5.5	Separation Geotextile	SY	69,846		
38	P-307-7.1	Cement-Treated Permeable Base (CTPB) (6-in)	SY	57,372		
39	P-401-8.1	Asphalt Surface Course	TON	935		
40	P-401-8.2	Asphalt Base Course	TON	495		
41	P-403-8.1	Asphalt Mixture Surface Course	TON	1,969		
42	P-501-8.1	16-in Concrete Pavement, Unreinforced	SY	43,131		
43	P-501-8.2	16-in Concrete Pavement, Reinforced	SY	12,947		
44	P-501-8.3	Concrete Panel Replacement	SY	683		
45	P-603-5.1	Emulsified Asphalt Tack Coat	GA	1,771		
46	P-620-5.1	Reflective Marking	SF	35,948		
47	P-620-5.2	Non-Reflective Marking	SF	56,238		
48	P-620-5.3	Temporary Marking	SF	6,798		
49	P-620-5.4	Marking Removal	SF	40,845		
50	P-620-5.5	Preformed Markings	SF	14,910		
51	D-701-5.1	Reinforced Concrete Pipe (Storm Sewer), Class V - 24-in	LF	563		
52	D-701-5.2	Reinforced Concrete Pipe (Storm Sewer), Class V - 36-in	LF	2,242		
53	D-701-5.3	Reinforced Concrete Pipe (Storm Sewer), Class V - 42-in	LF	1,579		
54	D-705-5.1a	8-inch Perforated HDPE Underdrain in Turf	LF	11,704		
55	D-705-5.1b	8-inch Non-Perforated HDPE Underdrain in Turf	LF	2,415		
56	D-705-5.1c	8-inch Perforated HDPE Underdrain	LF	2,301		

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Bidder's Initials []

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WBS No. «HAS No. 770»

BID FORM

PART B

Bid Schedule A - Eligible

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
57	D-705-5.1d	8-inch Non-Perforated HDPE Underdrain	LF	2,302		
58	D-705-5.1e	8-inch Non-Perforated HDPE Underdrain under Full-Strength Pavement	LF	150		
59	D-705-5.2	2-inch PVC-H Drain Conduit	LF	1,000		
60	D-751-5.1	Aircraft Rated Manholes	EA	4		
61	D-751-5.2	Concrete Collar	EA	32		
62	D-751-5.3	Aircraft Rated Inlets 2- Grate	EA	10		
63	D-751-5.4	Underdrain Manhole	EA	24		
64	D-751-5.5	Underdrain Cleanout	EA	25		
65	D-751-5.6	Existing Inlet Cap	EA	2		
66	T-904-5.1	Sodding	SY	188,139		
67	T-905-5.1	Topsoil (Furnished from Off the Site)	CY	21,901		
68	L-100-5.1	Vendor Modifications to ALCMS Equipment	AL	1	\$ 20,403.12	\$ 20,403.12
69	L-100-5.2	Contractor Support of ALCMS Installation	LS	1		
70	L-105-5.1	Cable Removal	LF	60,000		
71	L-105-5.2	Conduit or Ductbank Removal	LF	13,500		
72	L-105-5.3	Removal of Existing Light Fixture and Foundation	EA	252		
73	L-105-5.4	Removal of Existing Guidance Sign and Foundation	EA	36		
74	L-105-5.5	Removal of Existing Electrical/Communications Structure	EA	56		
75	L-108-5.1	No. 8 AWG, 5kV, L-824C Cable, Installed in Duct Bank or Conduit	LF	180,000		

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Bidder's Initials []

ISSUED FOR BID
APRIL 11, 2023

«FAA Non-Standard Taxiway»

BID FORM

WBS No. «HAS No. 770»

PART B**Bid Schedule A - Eligible**

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
76	L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed Above Conduit	LF	29,925		
77	L-108-5.3	Ground Rod 10' Section, Installed in place	EA	946		
78	L-108-5.4	No. 10 XHHW-2 Cable Installed in Conduit (FAA MALSR)	LF	2,000		
79	L-108-5.5	No. 4 XHHW-2 Cable Installed in Conduit(FAA MALSR)	LF	350		
80	L-108-5.6	No. 2 XHHW-2 Cable Installed in Conduit (FAA MALSR)	LF	16,000		
81	L-108-5.7	No. 3/0 XHHW-2 Cable Installed in Conduit (FAA MALSR)	LF	8,000		
82	L-108-5.8	No. 1/0 Bare Copper Guard Wire (FAA MALSR)	LF	2,500		
83	L-110-5.1	Direct Buried 1-Way, 2" PVC Conduit, Installed in Turf	LF	15,000		
84	L-110-5.2	Concrete Encased Electrical Duct Bank 1-Way, 2" PVC Conduit	LF	7,000		
85	L-110-5.3	Concrete Encased Electrical Duct Bank 4-Way, 2" PVC Conduit	LF	4,000		
86	L-110-5.4	Concrete Encased Electrical Duct Bank 8-Way, 2" PVC Conduit	LF	2,300		
87	L-110-5.5	Direct Buried 1-Way, 4" PVC Conduit Installed in Turf	LF	500		
88	L-110-5.6	Concrete Encased, 1-Way, 4" PVC Conduit Installed in Pavement	LF	30		
89	L-110-5.7	Direct Buried 2-Way, 4" PVC Conduit Installed in Turf	LF	200		
90	L-110-5.8	Direct Buried 3-Way, 4" PVC Conduit Installed in Turf	LF	400		
91	L-110-5.9	Direct Buried 4-Way, 4" PVC Conduit Installed in Turf	LF	900		
92	L-110-5.10	Concrete Encased, 4-Way, 4" PVC Conduit Installed in Pavement	LF	100		

02-07-2020

00410B-5

Bidder's Initials []

ISSUED FOR BID
APRIL 11, 2023

«FAA Non-Standard Taxiway»

BID FORM

WBS No. «HAS No. 770»

PART B**Bid Schedule A - Eligible**

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
93	L-115-5.1	Electrical Manhole	EA	7		
94	L-115-5.2	L-867B Electrical Base Can in Turf	EA	2		
95	L-115-5.3	L-868B Electrical Base Can in Pavement	EA	3		
96	L-115-5.4	Electrical Handhole	EA	5		
97	L-115-5.5	FAA Handhole	EA	7		
98	L-115-5.6	Communications Handhole	EA	10		
99	L-115-5.7	Reduce Height of Existing Structure to Grade	EA	2		
100	L-120-5.1	Temporary Lighting Cable	LS	1		
101	L-120-5.2	Circuit Investigation and Tracing	LS	1		
102	L-120-5.3	Subsurface Utility Location	LS	1		
103	L-125-5.1	Install New 3/8" Steel Plate on Existing L-867 Base Can	EA	2		
104	L-125-5.2	Install New 3/4" Steel Plate on Existing L-868 Base Can	EA	16		
105	L-125-5.3	Install New L-861T(L) LED Taxiway Edge Light on New L-867 Base Can in Turf	EA	207		
106	L-125-5.4	Install New L-861T(L) LED Taxiway Edge Light on New L-867 Base Can in Shoulder Pavement	EA	28		
107	L-125-5.5	Install New L-861T(L) LED Taxiway Edge Light on Existing L-867 Base Can	EA	1		
108	L-125-5.6	Install New L-861(L) LED Medium Intensity Runway Edge Light on New L-867 Base Can in Shoulder Pavement	EA	4		
109	L-125-5.7	Install New L-862(L) LED High Intensity Runway Edge Light on New L-867 Base Can in Shoulder Pavement	EA	10		

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Bidder's Initials []

ISSUED FOR BID
APRIL 11, 2023

«FAA Non-Standard Taxiway»
WBS No. «HAS No. 770»

BID FORM**PART B****Bid Schedule A - Eligible**

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
110	L-125-5.8	Install New L-862E(L) LED High Intensity Runway End/Threshold Light on New L-867B Base Can in New Shoulder Pavement	EA	3		
111	L-125-5.9	Install New L-862E(L) LED High Intensity Runway End/Threshold Light on New L-867B Base Can Cored into Existing Blast Pad Pavement	EA	12		
112	L-125-5.10	Install New L-862E(L) LED High Intensity Runway End/Threshold Light on Existing L-867B Base Can	EA	1		
113	L-125-5.11	Install New L-852C/D(L) LED Taxiway Centerline Light on New L-868B Base Can in New Full Strength Taxiway Pavement	EA	35		
114	L-125-5.12	Install New L-852C/D(L) LED Taxiway Centerline Light on New L-868B Base Can in New Full Strength Runway Pavement	EA	16		
115	L-125-5.13	Install New L-852G(L) LED In-Pavement Runway Guard Light on New L-868B Base Can in New Full Strength Pavement	EA	37		
116	L-125-5.14	Install New L-852T(L) LED In-Pavement Taxiway Edge on New L-868B Base Can in Existing Full Strength Pavement	EA	9		
117	L-125-5.15	Install New L-858(L) LED Airfield Lighting Sign, 1 Module, on New Foundation	EA	8		
118	L-125-5.16	Install New L-858(L) LED Airfield Lighting Sign, 2 Modules, on New Foundation	EA	9		
119	L-125-5.17	Install New L-858(L) LED Airfield Lighting Sign, 3 Modules, on New Foundation	EA	8		

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00410B-7

Bidder's Initials []

ISSUED FOR BID
APRIL 11, 2023

«FAA Non-Standard Taxiway»
WBS No. «HAS No. 770»

BID FORM**PART B****Bid Schedule A - Eligible**

Item No.	Spec Ref.	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
120	L-125-5.18	Install New L-858(L) LED Airfield Lighting Sign, 4 Modules, on New Foundation	EA	14		
121	L-125-5.19	Install New L-804(L) Elevated Runway Guard Lights on New L-867 Base Can in Turf	EA	6		
122	L-125-5.20	Install New L-852S (L) In-Pavement Runway Stop Bar Lights on New L-868 Base Can in Full Strength Pavement	EA	14		
123	L-125-5.21	Install MALSR Light Bar (5 EMT-Mounted Lights)	LS	1		
124	SS-360-5.1	Continuously Reinforced Concrete Pavement (12-inch)	SY	2,226		
TOTAL BASE UNIT PRICES BID SCHEDULE A (ELIGIBLE)						\$ _____

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«FAA Non-Standard Taxiway»
WBS No. «HAS No. 770»

BID FORM**PART B****B. CASH ALLOWANCE TABLE:**

Item No.	Spec Ref.	Cash Allowance Short Title	Cash Allowance in figures (1)
1.	01210, 1.02 A.	A. Existing Utility Line Relocation, Abandonment, or Removal B. Site Condition Specific Safety Conditions C. Airfield Safety Controls Allowance D. Contaminated Material Handling E. Additional Flagger and Barricades Associated with Phasing / Operations F. Building Permit: For obtaining the Building Permit from City of Houston	\$300,000.00
2.	L-120, 1.3.G	General Safety Provisions	\$50,000.00
<u>TOTAL CASH ALLOWANCES</u>			[\$350,000.00]

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«FAA Non-Standard Taxiway»
 WBS No. «HAS No. 770»

BID FORM

PART B

C. ALTERNATES TABLE:

Item No.	Spec Ref./Plan Sheet	Base Unit Short Title	Unit of Measure	Estimated Quantity	Unit Price (this column controls)	Total in figures
		N/A				

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FAA Non-Standard Taxiway
HAS No. 770

**BID FORM
PART B**

D. TOTAL BID PRICE: \$ _____
(Add Totals for Stipulated Price, Base Unit Price, Extra Unit Price, Cash Allowance, and All Alternates, if any)

2.0 SIGNATURES: By signing this Document, I agree that I have received and reviewed all Addenda and considered all costs associated with the Addenda in calculating the Total Bid Price.

Bidder: _____
(Print or type full name of your proprietorship, partnership, corporation, or joint venture.*)

****By:** _____
Signature Date

Name: _____
(Print or type name) Title

Address: _____
(Mailing)

(Street, if different)

Telephone and Fax Number: _____
(Print or type numbers)

* If Bid is a joint venture, add additional Bid Form signature sheets for each member of the joint venture.

** Bidder certifies that the only person or parties interested in this offer as principals are those named above. Bidder has not directly or indirectly entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding.

Note: This document constitutes a government record, as defined by § 37.01 of the Texas Penal Code. Submission of a false government record is punishable as provided in § 37.10 of the Texas Penal Code.

Footnotes for Tables A through C:

- (1) Fixed Unit Price determined prior to Bid. Cannot be adjusted by the Bidder.
- (2) Minimum Bid Price determined prior to Bid. Can be increased by the Bidder, but not decreased, by crossing out the Minimum and inserting revised price on the line above. **Cannot** be decreased by the Bidder.
- (3) Maximum Bid Price determined prior to Bid. Can be decreased by the Bidder, but not increased, by crossing out the Maximum and inserting revised price on the line above. A Bid that increases the Maximum Bid Price may be found non-conforming and non-responsive. **Cannot** be increased by the Bidder.
- (4) Fixed Range Bid Price determined prior to Bid. Unit Price can be adjusted by Bidder to any amount within the range defined by crossing out prices noted and noting revised price on the line above.

Item D-705 Pipe Underdrains for Airports

DESCRIPTION

705-1.1 This item shall consist of the construction of pipe drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

705-2.1 General. Materials shall meet the requirements shown on the plans and specified below.

705-2.2 Pipe. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements.

AASHTO M252 Standard Specification for Corrugated Polyethylene Drainage Pipe

705-2.3 Joint mortar. Pipe joint mortar shall consist of one part by volume of Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

705-2.4 Elastomeric seals. Elastomeric seals shall conform to the requirements of ASTM F477.

705-2.5 Porous backfill. Porous backfill shall be free of clay, humus, or other objectionable matter, and shall conform to the gradation in Table 1 when tested in accordance with ASTM C136.

Table 1. Gradation of Porous Backfill

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
	Porous Material No.
1-1/2 inch	100
1 inch	90-100
3/8 inch	25-60
No. 4	5-40
No. 8	0-20

When two courses of porous backfill are specified in the plans, the finer of the materials shall conform to particle size tabulated herein for porous material No. 1. The coarser granular material shall meet the gradation given in the tabulation for porous material No. 2.

705-2.6 Granular material. Granular material used for backfilling shall conform to the requirements of ASTM D2321 for Class IA, IB, or II materials.

705-2.7 Filter fabric. The filter fabric shall conform to the requirements of AASHTO M288 Class 2 or equivalent.

Table 2. Fabric Properties

Fabric Property	Test Method	Test Requirement
Grab Tensile Strength, lbs	ASTM D4632	125 min
Grab Tensile Elongation %	ASTM D4632	50 min
Burst Strength, psi	ASTM D3787	125 min
Trapezoid Tear Strength, lbs	ASTM D4533	55 min
Puncture Strength, lbs	ASTM D4833	40 min
Abrasion, lbs	ASTM D4886	15 max loss
Equivalent Opening Size	ASTM D4751	70-100
Permittivity sec⁻¹	ASTM D4491	0.80
Accelerated Weathering (UV Stability) (Strength Retained - %)	ASTM D4355 *(500 hrs exposure)	70

705-2.8 Controlled low-strength material (CLSM). Controlled low-strength material shall conform to the requirements of Item P-153. All joints shall have elastomeric seals.

CONSTRUCTION METHODS

705-3.1 Equipment. All equipment required for the construction of pipe underdrains shall be on the project, in good working condition, and approved by the RPR before construction is permitted to start.

705-3.2 Excavation. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe but shall not be less than the external diameter of the pipe plus 6 inches on each side of the pipe. The trench walls shall be approximately vertical.

Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 4 inches. The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The RPR shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

Excavated material not required or acceptable for backfill shall be disposed of by the Contractor as directed by the RPR. The excavation shall not be carried below the required depth; if this occurs, the trench shall be backfilled at the Contractor's expense with material approved by the RPR and compacted to the density of the surrounding material.

The pipe bedding shall be constructed uniformly over the full length of the pipe barrel, as required on the plans. The maximum aggregate size shall be 1 inch when the bedding thickness is less than 6 inches, and 1-1/2 inch when the bedding thickness is greater than 6 inches. Bedding shall be loosely placed, uncompacted material under the middle third of the pipe prior to placement of the pipe.

The Contractor shall do trench bracing, sheathing, or shoring necessary to perform and protect the excavation as required for safety and conformance to federal, state and local laws. Unless otherwise provided, the bracing, sheathing, or shoring shall be removed by the Contractor after the backfill has reached at least 12 inches over the top of the pipe. The sheathing or shoring shall be pulled as the granular backfill is placed and compacted to avoid any unfilled spaces between the trench wall and the backfill material. The cost of bracing, sheathing, or shoring, and the removal of same, shall be included in the unit price bid per foot for the pipe.

705-3.3 Laying and installing pipe.

a. PVC, fiberglass, or polyethylene pipe. PVC or polyethylene pipe shall be installed in accordance with the requirements of ASTM D2321. Perforations shall meet the requirements of AASHTO M252 or AASHTO M294 Class 2, unless otherwise indicated on the plans. The pipe shall be laid accurately to line and grade. Fiberglass per ASTM D3839 Standard Guide for Underground Installation of "Fiberglass" (Glass-Fiber Reinforced Thermosetting-Resin) Pipe.

b. All types of pipe. The upgrade end of pipelines, not terminating in a structure, shall be plugged or capped as approved by the RPR.

Unless otherwise shown on the plans, a 4-inch bed of granular backfill material shall be spread in the bottom of the trench throughout the entire length under all perforated pipe underdrains.

Pipe outlets for the underdrains shall be constructed when required or shown on the plans. The pipe shall be laid with tight-fitting joints. Porous backfill is not required around or over pipe outlets for underdrains. All connections to other drainage pipes or structures shall be made as required and in a satisfactory manner. If connections are not made to other pipes or structures, the outlets shall be protected and constructed as shown on the plans.

c. Filter fabric. The filter fabric shall be installed in accordance with the manufacturer's recommendations, or in accordance with the AASHTO M288 Appendix, unless otherwise shown on the plans.

705-3.4 Mortar. The mortar shall be of the desired consistency for caulking and filling the joints of the pipe and for making connections to other pipes or to structures. Mortar that is not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted.

705-3.5 Joints in concrete pipe. Not used.

705-3.6 Embedment and Backfill

a. Earth. All trenches and excavations shall be backfilled soon after the pipes are installed, unless additional protection of the pipe is directed. The embedment material shall be select material from excavation or borrow and shall be approved by the RPR. The select material shall be placed on each side of the pipe out to a distance of the nominal pipe diameter and one foot over the top of the pipe and shall be readily compacted. It shall not contain stones 3 inches or larger in size, frozen lumps, chunks of highly plastic clay, or any other material that is objectionable to the RPR. The material shall be moistened or dried, as required to aid compaction. Placement of the embedment material shall not cause displacement of the pipe. Thorough compaction under the haunches and along the sides to the top of the pipe shall be obtained.

The embedment material shall be placed in loose layers not exceeding 6 inches in depth under and around the pipe. Backfill material over the pipe shall be placed in lifts not exceeding 8 inches. Successive layers shall be added and thoroughly compacted by hand and pneumatic tampers, approved by the RPR,

until the trench is completely filled and brought to the planned elevation. Embedment and backfilling shall be done to avoid damaging top or side of the pipe.

In embankments and other unpaved areas, the backfill shall be compacted per Item P-152 to the density required for embankments in unpaved areas. Under paved areas, the subgrade and any backfill shall be compacted per Item P-152 to the density required for embankments for paved areas.

b. Granular backfill. When granular backfill is required, placement in the trench and about the pipe shall be as shown on the plans. The granular backfill shall not contain an excessive amount of foreign matter, nor shall soil from the sides of the trench or from the soil excavated from the trench be allowed to filter into the granular backfill. When required by the RPR, a template shall be used to properly place and separate the two sizes of backfill. The backfill shall be placed in loose layers not exceeding 6 inches in depth. The granular backfill shall be compacted by hand and pneumatic tampers to the requirements as given for embankment. Backfilling shall be done to avoid damaging top or side pressure on the pipe. The granular backfill shall extend to the elevation of the trench or as shown on the plans.

When perforated pipe is specified, granular backfill material shall be placed along the full length of the pipe. The position of the granular material shall be as shown on the plans. If the original material excavated from the trench is pervious and suitable, it shall be used in lieu of porous backfill No. 1.

If porous backfill is placed in paved or adjacent to paved areas before grading or subgrade operations is completed, the backfill material shall be placed immediately after laying the pipe. The depth of the granular backfill shall be not less than 12 inches, measured from the top of the underdrain. During subsequent construction operations, a minimum depth of 12 inches of backfill shall be maintained over the underdrains. When the underdrains are to be completed, any unsuitable material shall be removed exposing the porous backfill. Porous backfill containing objectionable material shall be removed and replaced with suitable material. The cost of removing and replacing any unsuitable material shall be at the Contractor's expense.

If a granular subbase blanket course is used which extends several feet beyond the edge of paving to the outside edge of the underdrain trench, the granular backfill material over the underdrains shall be placed in the trench up to an elevation of 2 inches above the bottom surface of the granular subbase blanket course. Immediately prior to the placing of the granular subbase blanket course, the Contractor shall blade this excess trench backfill from the top of the trench onto the adjacent subgrade where it can be incorporated into the granular subbase blanket course. Any unsuitable material that remains over the underdrain trench shall be removed and replaced. The subbase material shall be placed to provide clean contact between the subbase material and the underdrain granular backfill material for the full width of the underdrain trench.

c. Controlled low-strength material (CLSM). Controlled low-strength material shall conform to the requirements of Item P-153.

705-3.7 Flexible Pipe Ring Deflection. Not used.

705-3.8 Connections. When the plans call for connections to existing or proposed pipe or structures, these connections shall be watertight and made to obtain a smooth uniform flow line throughout the drainage system.

705-3.9 Cleaning and restoration of site. After the backfill is completed, the Contractor shall dispose of all surplus material, soil, and rubbish from the site. Surplus soil may be deposited in embankments, shoulders, or as directed by the RPR. Except for paved areas of the airport, the Contractor shall restore all disturbed areas to their original condition.

METHOD OF MEASUREMENT

705-4.1 The length of pipe shall be the number of linear feet of pipe underdrains in place, completed, and approved; measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types, and sizes shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipeline being measured.

BASIS OF PAYMENT

705-5.1 Payment will be made at the contract unit price per linear foot for pipe underdrains of the type, class, and size designated. These prices shall be full compensation for furnishing all materials, and for all preparation, excavation, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

705-5.2 Payment will be made at the contract unit price per linear foot for drain conduits of the type, class, and size designated. These prices shall be full compensation for furnishing all materials, and for all preparation, excavation, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

705-5.3 No payment shall be made for granular backfill and geotextile filter fabric. These items shall be considered incidental to the preparation and installation of the pipe underdrains and conduit as specified in the plans.

Payment will be made under:

Item D-705-5.1a	8-inch Perforated HDPE Underdrain in Turf - per linear foot
Item D-705-5.1b	8-inch Non-Perforated HDPE Underdrain in Turf – per linear foot
Item D-705-5.1c	8-inch Perforated HDPE Underdrain - per linear foot
Item D-705-5.1d	8-inch Non-Perforated HDPE Underdrain – per linear foot
Item D-705-5.1e	8-inch Non-Perforated HDPE Underdrain under Full-Strength Pavement – per linear foot
Item D-705-5.2	2-inch PVC-H Drain Conduit – per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates

Item D-705 Pipe Underdrains for Airports D-705-5
CITY OF HOUSTON AIRPORT SYSTEM
WILLIAM P. HOBBY AIRPORT
FAA NON-STANDARD TAXIWAYS PROJECT

ISSUED FOR BID
HAS NO. 770
APRIL 11, 2023

ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C444	Standard Specification for Perforated Concrete Pipe
ASTM C654	Standard Specification for Porous Concrete Pipe
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D3262	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Sewer Pipe
ASTM D4161	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F758	Standard Specification for Smooth Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage
American Association of State Highway and Transportation Officials (AASHTO)	
AASHTO M190	Standard Specification for Bituminous - Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M288	Standard Specification for Geotextile Specification for Highway Applications
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel-Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) diameter
AASHTO	Standard Specifications for Highway Bridges

END OF ITEM D-705

Item L-105 Alterations, Removal and Demolition

GENERAL

105-1.1 Definitions.

a. Alterations shall mean any change or rearrangement in the component parts, including structural, mechanical, electrical systems, or internal or external arrangements of an existing structure.

b. Removal shall mean the dismantling of existing materials, components, equipment, and utilities. Removed items shall be handled, prepared for storage, transported to storage areas as specified.

c. Demolition shall mean the dismantling and disposal of existing materials, components, equipment, and utilities which cannot or will not be reused or which will have no salvage value, or which cannot be reused due to unrepairable damage caused by age, non-demolition related reasons, etc. All demolished items not designated to be turned over to the Owner shall be disposed of in a safe manner and at a location acceptable to the Owner.

All items to be turned over to the Owner shall be properly enclosed or boxed to protect the items from damage and transported by the Contractor to a location on the airport, designated by the Engineer and/or the Owner.

The installation and/or removal of lighting equipment may be critical to airport operations; therefore, the Contractor shall follow the work schedule established in the plans and specifications or as directed by the Engineer. The system shall be installed in accordance with the National Electrical Code and/or local code requirements.

The Contractor shall provide temporary wiring as required to reconnect existing circuits to provide guidance for aircraft to pass through the construction areas on those taxiways/runways which must remain open. The Contractor shall check all temporary circuits before dark each day to assure that they are operational. In the event of failure, the Contractor shall immediately take steps to restore operation. Payment for this work will be under section L-120.

105-1.2 Condition of existing facilities. The Contractor shall verify the areas, conditions, and features necessary to tie into existing construction. This verification shall be done prior to submittal of shop drawings, fabrication or erection, construction or installation. The Contractor shall be responsible for the accurate tie-in of the new work to existing facilities.

Whenever the scope of work requires connection to an existing circuit, the circuit's insulation resistance shall be tested, in the presence of the Owner and Engineer. The Contractor shall record the results and provide promptly to the RPR prior to the start of work. When the circuit is returned to its final condition, the circuit's insulation resistance shall be checked again in the presence of the Owner and Engineer. The Contractor shall record the results on the forms included in these specifications. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in Operation and Maintenance Manuals.

105-1.3 Classification of removed/demolished items. Existing materials and equipment indicated to be removed shall be presented to the owner for salvage. All materials and equipment not selected for salvage shall become the property of the contractor and be disposed of legally off site.

a. Reusable salvaged items. Salvaged materials and equipment shall be reused in the work ONLY IF described on the contract drawings, unless noted otherwise. Items not selected for salvage shall be legally disposed of off the airport property. The cost of such disposal shall be included in the cost of the line item or other items of work.

b. Retained salvage items. Salvaged materials and equipment to be retained by the Owner, but not reused in the work shall be turned over to the Airport at a site at the facility to be determined by the Resident Project Representative. Retained salvaged items shall be stored on the Airport property where indicated by the Resident Project Representative

CONSTRUCTION METHODS

105-2.1 Disconnecting utilities. Prior to the start of work, the necessary utilities serving each area of alteration or removal will be shut off by the Owner and shall be disconnected and sealed by the Contractor, as required. The contractor shall properly lockout/tagout all circuits prior to performing work.

105-2.2 Temporary utility services. The Contractor shall install temporary utility services in satisfactory operating condition before disconnecting existing utilities. Such temporary services shall be maintained during the period of construction and removed only after new permanent services have been tested and are in operation.

105-2.3 Removal work. The Contractor shall not disturb the existing construction beyond that indicated or necessary for installation of new work.

105-2.4 Salvageable materials and equipment. The Contractor shall remove all salvageable materials and equipment in a manner that will cause the least possible damage thereto. Removed items which are to be retained by the Owner shall be carefully handled, stored, and protected. The Contractor shall provide identification tags on all items boxed or placed in containers, indicating the type, size, and quantity of materials. All materials and equipment shall be secured to a pallet. Components shall be protected from moisture with shrink wrap. Contractor shall provide a type written list of all items on each pallet. Equipment list shall identify each item per pallet. Coordinate with the Resident Project Representative and the airport to deliver pallets to location at the airport as determined by the airport salvageable equipment returned to the airport shall include; light fixtures, isolation transformers guidance signs

105-2.5 Electrical Equipment and Fixtures. All unused conduit not removed or abandoned shall have a pull string installed and shall be noted on the record drawings.

The Contractor shall remove and salvage electrical fixtures. Lamps shall be salvaged, boxed and tagged for identification, and protected from breakage.

The Contractor shall remove all existing taxiway and runway signage where indicated on the drawings. Signs shall be protected against damage and weather. Contractor shall store signs in a safe location unless otherwise noted by the airport. Contractor shall be responsible for any damage to the signs that is caused by the contractor and construction associated with this contract.

The contractor shall remove all existing taxiway edge lights, base plates and isolation transformers where indicated on the drawings, separate and package them for protection and turn over to the airport at a location specified by them. Contractor shall be responsible for any damage to the equipment that is caused by the contractor and construction associated with this contract.

The contractor shall remove and dispose of all series lighting cable, ground conductors and connectors. The contractor shall remove and dispose of light bases, handholes, manholes, foundations and conduits not used in the finished work and shown to be demolished on the plans.

DEMOLITION

105-3.1 Demolition Operations. Demolition operations shall be conducted to ensure the safe passage of persons to and from facilities occupied and used by the Owner and to prevent damage by falling debris or other cause to adjacent buildings, structures, and other facilities.

The sequence of operations shall be such that maximum protection from inclement weather will be provided for materials and equipment located in partially dismantled structures.

105-3.2 Maintaining Traffic. Demolition operations and removal of debris to disposal areas shall be conducted to ensure minimum interference with runways, taxiways, aprons, roads, streets, walks, and other facilities occupied and used by the Owner.

Streets, walks, runways, taxiways and other facilities occupied and used by the Owner shall not be closed or obstructed without written permission from the Owner.

105-3.3 Reference Standards Requirements. Demolition operations shall be conducted to ensure the safety of persons in accordance with ANSI A 10.6 Safety Requirements for Demolition. Demolition shall be conducted in accordance with OSHA, State and local requirements.

105-3.4 General Disposal. The Contractor shall dispose of debris, rubbish, scrap, and other non-salvageable materials resulting from demolition operations. Demolished materials shall not be stored or disposed of on Airport property.

105-3.5 Removal from Owner Property. Materials not selected for salvage shall be transported from Airport property and legally disposed of at no additional cost to the Owner. Permits and fees for disposal shall be paid by the Contractor.

METHOD OF MEASUREMENT

105-4.1 The quantity of cables removed from existing electrical ducts shall be measured by the linear foot along the length of each duct from which they are removed. **Multiple cables in a single duct shall be measured by the length of the duct, shall be removed in a single pull and shall be measured once for all cables contained in the length of the duct (a 200' run with 3 cables inside shall be paid 200' not 600').** Cables removed from a duct shall not be measured individually. Any other removals required shall be considered incidental to the bid items provided.

105-4.2 The quantity of conduit to be removed shall be measured by the linear foot, including backfill if required to bring the grade level with grading operations. **Payment shall be made for a length of trench run from which conduit is removed, regardless of the number of conduits encountered (e.g. a four-way ductbank measuring 200' long is calculated as 200' of conduit demolition).** Conduit shall only be paid for removal under this line item where it is not found under existing pavement; no separate payment will be made for the demolition of conduit under pavement, it shall be deemed incidental to pavement demolition.

105-4.3 The quantity of "Removal of Existing Light Fixture" to be paid for under this item shall be the number of taxiway lights removed, including the light fixture, base, concrete encasement, isolation transformer, L-823 connectors and heat shrink, and incidentals as shown on the Drawings and accepted by the Engineer.

105-4.4 The quantity of "Removal of Existing Guidance Sign" to be paid for under this item shall be the number of guidance signs removed, as shown on the Drawings, and accepted by the Engineer. Items shall include but are not limited to the sign, frangible couplings, L-867 sign junction box, junction box base plate, gasket, bolts, anchor bolts, sign tether, concrete foundation, conduit, concrete encased isolation transformer housing, steel plate cover, isolation transformer, connector kits, heat shrink, L-823 extension cord, ground rod and backfill/restoration of the area. There will be no distinction made for different size signs with varying number of modules.

105-4.5 The quantity of "Removal of Existing Structure" to be paid for under this item shall be the number of communications or electrical structures removed, as shown on the Drawings, and accepted by the Engineer. Items shall include but are not limited to the frame/grate/lid, concrete or other structure, bolts, adjacent conduit, ground rod and backfill/restoration of the area. There will be no distinction made for different size structures.

BASIS OF PAYMENT

105-5.1 Payment for Cable Removal will be made at the contract unit price per linear foot as accepted by the Engineer. This price shall be full compensation for all labor, equipment, tools, supplies, and incidentals necessary to complete the work. It shall also include the installation of a new pull wire where conduit is called to remain.

105-5.2 Payment for Conduit Removal will be made at the contract unit price per linear foot of conduit or ductbank removed and restored to grade as accepted by the Engineer. This price shall be full compensation for all labor, equipment, tools, supplies, and incidentals necessary to complete the removal of conduit outside of pavement limits. Conduit within the limits of pavement to be demolished shall not be paid.

105-5.3 Payment will be made at the contract unit price for each complete fixture removed and accepted by the Engineer. This price shall be full compensation for all preparation and materials related to the complete removal and subsequent restoration of the site around each light fixture and base can as shown on the Plans and for all labor, equipment, tools and incidentals necessary to complete this item.

105-5.4 Payment shall be made at the Contract unit price per each complete guidance sign, removed and accepted by the Engineer. This price shall be full compensation for all preparation and materials related to the complete removal and subsequent restoration of the site around each sign and foundation as shown on the Plans and for all labor, equipment, tools and incidentals necessary to complete this item.

105-5.5 Payment shall be made at the Contract unit price per each complete electrical or communications structure removed and accepted by the Engineer. This price shall be full compensation for all preparation and materials related to the complete removal and subsequent restoration of the site around each structure as shown on the Plans and for all labor, equipment, tools and incidentals necessary to complete this item.

Payment shall be made under:

- | | |
|-----------|--|
| L-105-5.1 | Cable Removal - per linear foot |
| L-105-5.2 | Conduit or Ductbank Removal – per linear foot |
| L-105-5.2 | Removal of Existing Light Fixture and Foundation – per each |
| L-105-5.3 | Removal of Existing Guidance Sign and Foundation – per each |
| L-105-5.4 | Removal of Existing Electrical/Communications Structure – per each |

END OF ITEM L-105

ITEM L-108 UNDERGROUND POWER CABLE FOR AIRPORTS

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the RPR. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities.

EQUIPMENT AND MATERIALS

108-2.1 General.

a. Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the RPR.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the RPR) and replaced with materials that comply with these specifications at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format. The RPR reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.

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POWER CABLE FOR AIRPORTS
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f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner. The Contractor shall maintain a minimum insulation resistance in accordance with paragraph 108-3.10e with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period when tested in accordance with AC 150/5340-26, *Maintenance Airport Visual Aid Facilities*, paragraph 5.1.3.1, Insulation Resistance Test.

108-2.2 Cable. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge (AWG), L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Commercial Item Description A-A-59544A and shall be type THWN-2, 75°C for installation in conduit and RHW-2, 75°C for direct burial installations. Conductors for parallel (voltage) circuits shall be type and size and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600-volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600-volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

108-2.3 Bare copper wire (counterpoise, bare copper wire ground and ground rods). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for grounding bond wire per ASTM B3 and ASTM B8, and shall be bare copper wire. For voltage powered circuits, the equipment grounding conductor shall comply with NEC Article 250.

Ground rods shall be sectional copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet (2.54 m) long and 3/4 inch (19 mm) in diameter.

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108-2.4 Cable connections. In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

a. The cast splice. Not used.

b. The field-attached plug-in splice. Field attached plug-in splices shall be installed as shown on the plans. The Contractor shall determine the outside diameter of the cable to be spliced and furnish appropriately sized connector kits and/or adapters. Tape shall be in accordance with the manufacturer's requirements. Primary Connector Kits manufactured by Amerace, "Super Kit", Integro "Complete Kit", or approved equal is acceptable.

c. The factory-molded plug-in splice. Not used.

d. The taped or heat-shrink splice. Not used.

108-2.5 Splicer qualifications. Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the RPR proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 Concrete. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

108-2.7 Flowable backfill. Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

108-2.8 Cable identification tags. Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

108-2.9 Tape. Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

108-2.10 Electrical coating. Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

108-2.11 Existing circuits. Whenever the scope of work requires connection to an existing circuit, the existing circuit's insulation resistance shall be tested, in the presence of the RPR. The test shall be performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the RPR. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the RPR. The Contractor shall record the results on forms acceptable to the RPR. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the existing circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

108-2.12 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend

tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide, or as shown on the plans. Detectable tape is incidental to the respective bid item. Detectable warning tape for communication cables shall be orange. Detectable warning tape color code shall comply with the APWA Uniform Color Code.

CONSTRUCTION METHODS

108-3.1 General. The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Cable shall be run without splices, from fixture to fixture.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the RPR or shown on the plans.

Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed and on both sides of slack loops where a future connector would be installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the RPR.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

108-3.2 Installation in duct banks or conduits. This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through

duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the RPR prior to any cable installation. If required by the RPR, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the RPR. Cable pull tensions shall be recorded by the Contractor and reviewed by the RPR. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

108-3.3 Installation of direct-buried cable in trenches. Not used.

108-3.4 Cable markers for direct-buried cable. Not used.

108-3.5 Splicing. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

a. Cast splices. Not used.

b. Field-attached plug-in splices. These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint or (2) On connector kits equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

c. Factory-molded plug-in splices. Not used.

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d. Taped or heat-shrink splices. Not used.

e. Assembly. Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

108-3.6 Bare counterpoise wire installation for lightning protection and grounding. If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The RPR shall select one of two methods of lightning protection for the airfield lighting circuit based upon sound engineering practice and lightning strike density.

a. Equipotential. The counterpoise size is as shown on the plans. The equipotential method is applicable to all airfield lighting systems; i.e. runway, taxiway, apron – touchdown zone, centerline, edge, threshold and approach lighting systems. The equipotential method is also successfully applied to provide lightning protection for power, signal and communication systems. The light bases, counterpoise, etc – all components - are bonded together and bonded to the vault power system ground loop/electrode.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables. The counterpoise is centered over the cable/conduit/duct to be protected.

The counterpoise conductor shall be installed no less than 8 inches (200 mm) minimum or 12 inches (300 mm) maximum above the raceway or cable to be protected, except as permitted below:

(1) The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

(2) The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection, (45 degrees on each side of vertical creating a 90 degree angle).

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

All components rise and fall at the same potential; with no potential difference, no damaging arcing and no damaging current flow.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Equipotential Method of lightning protection.

Reference FAA STD-019E, Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment, Part 4.1.1.7.

b. Isolation. Not used.

c. Common Installation requirements. When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

Grounding electrodes may be rods, ground dissipation plates, radials, or other electrodes listed in the NFPA 70 (NEC) or NFPA 780.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

d. Parallel Voltage Systems. Provide grounding and bonding in accordance with NFPA 70, National Electrical Code.

108-3.7 Counterpoise installation above multiple conduits and duct banks. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete area of protection measured 45 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

108-3.8 Counterpoise installation at existing duct banks. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.9 Exothermic bonding. Bonding of counterpoise wire shall be by the exothermic welding process or equivalent method accepted by the RPR. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the RPR, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer's recommendations and the following:

a. All slag shall be removed from welds.

b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not allowed unless the base has been specially modified. Consult the manufacturer's installation directions for proper methods of bonding copper wire to the light base. See AC 150/5340-30 for galvanized light base exception.

c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.10 Testing. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the RPR. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the RPR. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

a. Earth resistance testing methods shall be submitted to the RPR for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the RPR. All such testing shall be at the sole expense of the Contractor.

b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The RPR shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the RPR the following:

c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

d. That all affected circuits (existing and new) are free from unspecified grounds.

e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 50 megohms. Verify continuity of all series airfield lighting circuits prior to energization.

f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.

g. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

h. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

i. That the impedance to ground of each ground rod does not exceed 25 ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing

requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the RPR prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the RPR. Where connecting new cable to existing cable, insulation resistance tests shall be performed on the new cable prior to connection to the existing circuit.

Additional ground rods may be driven to improve testing results. There are no approved "repair" procedures for items that have failed testing other than complete replacement.

METHOD OF MEASUREMENT

108-4.1 Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The measurement for this item shall not include additional quantities required for slack. Cable and counterpoise slack is considered incidental to this item and is included in the Contractor's unit price. No separate measurement or payment will be made for cable or counterpoise slack. Heat shrink shall not be used on cable connections.

108-4.2 Ground rods shall be paid for in 10-foot segments installed in place.

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price for cable and equipment ground installed in duct bank or conduit, or for counterpoise installed above conduit, in place by the Contractor and accepted by the RPR. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item.

108-5.2 Payment for FAA cable will be for cable installed between the junction/distribution box at MALSR Station 14 and the light fixtures associated with the MALSR as shown on the plan. Complete wiring diagrams will be provided to the successful bidder. Contractor shall reuse existing fixtures at all locations and as well as existing isolation transformers at in-pavement light locations. Cable shall be XHHW-2 in accordance with FAA-E-2013e, cable suitable for exterior installations in duct. The price shall be full compensation for furnishing all material for all preparation and installation of these materials, and for all labor, equipment, tools and incidentals including cable connectors, cable tags, cable splices, and connections to existing infrastructure as needed.

Payment will be made under:

Item L-108-5.1	No. 8 AWG, 5 kV, L-824C Cable, Installed in Duct Bank or Conduit - per linear foot
Item L-108-5.2	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed Above Conduit - per linear foot

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Item L-108-5.3	Ground Rod 10' Section, Installed in place - per each
Item L-108-5.4	No. 10 XHHW-2 Cable Installed in Conduit (FAA MALSR) - per linear foot
Item L-108-5.5	No. 4 XHHW-2 Cable Installed in Conduit (FAA MALSR) - per linear foot
Item L-108-5.6	No. 2 XHHW-2 Cable Installed in Conduit (FAA MALSR) - per linear foot
Item L-108-5.7	No. 3/0 XHHW-2 Cable Installed in Conduit (FAA MALSR) - per linear foot
Item L-108-5.8	No. 1/0 Bare Copper Guard Wire (FAA MALSR) - per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description

A-A-59544A	Cable and Wire, Electrical (Power, Fixed Installation)
A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

ASTM International (ASTM)

ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes

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FAA ISSUE DATE: 12/21/2018

AC 150/5370-10H

Mil Spec

MIL-PRF-23586F Performance Specification: Sealing Compound (with Accelerator),
Silicone Rubber, Electrical

MIL-I-24391 Insulation Tape, Electrical, Plastic, Pressure Sensitive

National Fire Protection Association (NFPA)

NFPA-70 National Electrical Code (NEC)

NFPA-780 Standard for the Installation of Lightning Protection Systems

American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

ANSI/IEEE STD 81 IEEE Guide for Measuring Earth Resistivity, Ground Impedance,
and Earth Surface Potentials of a Ground System

Federal Aviation Administration Standard

**FAA STD-019F Lightning and Surge Protection, Grounding Bonding and
Shielding Requirements for Facilities and Electronic
Equipment**

**FAA STD-C-1391D Installation, Termination, Splicing, and Transient/Surge
Protection of Underground Electrical Distribution System
Power Cables**

FAA STD-E-2013e Cable, Electrical Power, Exterior 600 Volts

END OF ITEM L-108

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ITEM L-110 AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits. It shall also include all turving trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 General.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the RPR.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, that comply with these specifications, at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR reserves the right to reject any and all

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equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

110-2.2 Steel conduit. Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10-mil thick coat of asphaltum sealer or shall have a factory-bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mils of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions. In lieu of PVC coated RGS, corrosion wrap tape shall be permitted to be used where RGS is in contact with direct earth."

110-2.3 Plastic conduit. Plastic conduit and fittings shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10. SEP
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high-density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

- a. Type I—Schedule 40 and Schedule 80 PVC suitable for underground use either direct-buried or encased in concrete.
- b. Type II—Schedule 40 PVC suitable for either above ground or underground use.
- c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.
- d. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 Split conduit. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 Conduit spacers. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads. They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 Concrete. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

110-2.7 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program. Precast concrete structures shall conform to ASTM C478.

110-2.8 Flowable backfill. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

110-2.9 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) red (electrical power lines, cables, conduit and lighting cable), orange (telephone/fiber optic cabling) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 General. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The RPR shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. Under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade; in other locations, the top of the duct bank or underground conduit shall be not less than 18 inches (0.5 m) below finished grade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor's expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts

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proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200-pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. Flowable backfill may alternatively be used

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the RPR. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer's recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

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Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the RPR, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Additional duct bank supports shall be installed, as approved by the RPR.

All excavation shall be unclassified and shall be considered incidental to Item L-110. Dewatering necessary for duct installation, and erosion per federal, state, and local requirements is incidental to Item L-110.

Unless otherwise specified, excavated materials that are deemed by the RPR to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the RPR and compacted per Item P-152.

It is the Contractor's responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

- a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred
- b. Trenching, etc., in cable areas shall then proceed with approval of the RPR, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 Duct banks. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 2 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inches (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the RPR shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the RPR.

110-3.3 Conduits without concrete encasement. Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4-inch (6.3 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 2 inches (75 mm) apart (measured from outside wall to outside wall) in a

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horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

110-3.4 Markers. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m) along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the RPR, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the RPR. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the RPR. The letters shall be 4 inches (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 Backfilling for conduits. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.6 Backfilling for duct banks. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 "Excavation and Embankment" except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of Item P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period's construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.7 Restoration. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include sodding and seeding shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

110-3.8 Ownership of removed cable. Removed cable shall be disposed of properly off site at no cost to the owner.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks shall be measured by the linear feet of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated material, and restoration, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

Underground conduit for electrical drain lines of the same size and type as shown shall be installed under this pay item, with no additional compensation for any additional depth of installation required compared to the electrical conduit system.

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BASIS OF PAYMENT

110-5.1 Payment will be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material. Furnishing all materials for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications is included herein.

Payment will be made under:

Item L-110-5.1	Direct Buried 1-Way, 2" PVC Conduit, Installed in Turf - per linear foot
Item L-110-5.2	Concrete Encased, 1-Way, 2" PVC Conduit - per linear foot
Item L-110-5.3	Concrete Encased, 4-Way, 2" PVC Conduit – per linear foot
Item L-110-5.4	Concrete Encased, 8-Way, 2" PVC Conduit – per linear foot
Item L-110-5.5	Direct Buried 1-Way, 4" PVC Conduit Installed in Turf – per linear foot
Item L-110-5.6	Concrete Encased, 1-Way, 4" PVC Conduit Installed in Pavement – per linear foot
Item L-110-5.7	Direct Buried 2-Way, 4" PVC Conduit Installed in Turf – per linear foot
Item L-110-5.8	Direct Buried 3-Way, 4" PVC Conduit Installed in Turf – per linear foot
Item L-110-5.9	Direct Buried 4-Way, 4" PVC Conduit Installed in Turf – per linear foot
Item L-110-5.10	Concrete Encased, 4-Way, 4" PVC Conduit Installed in Pavement – per linear foot

References

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circular (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

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ASTM International (ASTM)

ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars
for Concrete Reinforcement

National Fire Protection Association (NFPA)

NFPA-70 National Electrical Code (NEC)

Underwriters Laboratories (UL)

UL Standard 6 Electrical Rigid Metal Conduit - Steel
UL Standard 514B Conduit, Tubing, and Cable Fittings
UL Standard 514C Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 1242 Electrical Intermediate Metal Conduit Steel
UL Standard 651 Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL Standard 651A Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110

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ITEM L-120 TEMPORARY ELECTRICAL WORK AND GENERAL ELECTRICAL SAFETY REQUIREMENTS

DESCRIPTION

120-1.1 PURPOSE

- (a) Temporary wiring will be required during specific phases of the project to maintain airfield operations daily. The Contractor shall refer to the Contract Drawings for phasing requirements.
- (b) The Contractor shall be responsible for installation and maintenance of all temporary lighting during the life of the contract. All necessary fixtures, wire, transformers, bases, etc., shall be furnished by the Contractor. All setup and removal, all circuit cut-ins, all repairs to damaged items and all other necessary functions to maintain temporary lighting as required above shall be performed by the Contractor as directed by the Engineer.
- (c) The Contractor is solely responsible for all issues related to the safety program and guidelines and implementation of such programs and guidelines necessary to protect aircraft, passengers, crews, the general public, all workers and vehicles involved in their daily tasks.

120-1.2 FAA ADVISORY CIRCULARS

All applicable requirements of the below listed advisory circulars (latest version), standards and related reading shall be compiled with:

1. FAA AC 150/5200-18, Airport Safety Self-Inspection
2. FAA AC 150/5210-5, Painting, Marking and Lighting of Vehicles
3. FAA AC 150/5340-18, Standards for Airport Sign Systems
4. FAA AC 150/5340-26, Maintenance of Airport Visual Aid Facilities
5. FAA AC 150/5340-30, Design and Installation Details for Airport Visual Aids
6. FAA AC 150/5370-2, Operational Safety On Airports During Construction
7. Occupational Safety and Health Standards for the construction industry 29 CFR Part 1926/1910

The Contractor is responsible for obtaining and using the latest edition of the referenced documents. This list is not all inclusive but is offered as a convenience to the Contractor.

120-1.3 GENERAL SAFETY PROVISIONS

- A. Contractor shall take safety and health measures in performing work under this contract. Contractor shall meet with the engineer to develop a mutual understanding relative to administration of the safety plan. Contractor is subject to applicable federal, state and local laws, regulations, ordinances, codes and orders relating to safety and health in effect on the date of this contract. Attention is invited to the regulations issued by the Secretary of Labor pursuant to the Contract Work Hours and Safety Standards Act and the Safety and Health Regulations for Construction. Contractor shall comply with the Secretary's Regulations as applicable and shall comply with specific requirements stated.
- B. As a minimum workplace safety shall comply with NFPA 70E Standard for Electrical Safety Requirements for Employee Workplaces, OSHA, federal, state and local requirements. Where a conflict in code requirements occurs the most stringent requirement shall govern.
- C. During the performance of work under this contract, the Contractor shall comply with procedures prescribed for control and safety of persons visiting the project site.
- D. Contractor is responsible for the Contractor's personnel and for familiarizing each of his Subcontractors with safety requirements.
- E. Contractor shall advise the Engineer of any special safety restrictions established so that Owner personnel can be notified of these restrictions.
- F. Contractor shall note that comprehensive as-built drawings of the circuiting are not available for the airfield or the construction area. As a result, impacted circuits shall be traced and mapped for effective temporary cabling installations. The contractor shall document the circuit routing and turn over to the resident engineer for review as a part of temporary cabling installation and operations.
- G. The electrical contractor shall be required to have staff available to respond to the project site within 30 minutes of an airport or RPR request, on any day where active construction has occurred or is expected to occur. ~~This shall be incidental to the overall cost of construction on the project.~~ **Costs associated with this requirement shall be paid for on an as needed basis utilizing the cash allowance as shown in Section 00410B.****

120-1.4 FIRE PREVENTION AND PROTECTION

- A. Burning trash, brush or wood on the project site will not be permitted.
- B. Flammable liquids shall be stored and handled in accordance with NFPA 30,

Flammable and Combustible Liquids Code and NFPA 30A, Code for Motor Fuel Dispensing Facilities and Repair Garages.

- C. Open fires and salamanders will not be permitted in construction areas.
- D. During operations involving possible fire hazard, the Contractor shall notify the Engineer and not proceed until clearance is obtained in writing.

120-1.5 ELECTRICAL SAFETY CODES

Recommendations of codes shall be followed in regard to electrical safety:

- A. National Electrical Code (NEC), NFPA 70 - Covers electrical wiring and equipment installed within, or on buildings and other premises.
- B. National Electrical Manufacturers Association (NEMA) - Standards cover electrical power equipment including standard ratings, performance, testing, manufacturing, and marking.
- C. Electronic Industries Association (EIA) - Standards cover electronic equipment and components.
- D. Insulated Powers Cable Engineers Association (IPCEA) - Standards cover insulated power, control and communication cable.
- E. Institute of Electrical and Electronic Engineers, Inc. (IEEE) - Standards consist of technical reports, and testing procedures generally used in electrical power generation, distribution and utilization.
- F. National Electrical Safety Code, ANSI C2 - Safety requirements for working with and around electrical equipment.
- G. Standard for Electrical Safety Requirements for Employee Workspaces, NFPA 70E - Covers protection of personnel from installation, safety related work practices, maintenance and special equipment requirements. Covers all aspects of electrical safety in the workplace.

120-1.6 SWITCHING

Electrical switching required for clearance to work on equipment operating from electrical circuits will be performed only by Owner personnel authorized as safety operators for the specific equipment.

120-1.7 OTHER SAFETY REQUIREMENTS

- A. Temporary wiring shall comply with NEC. Indiscriminate use of extension cords, portable cable or junction boxes creating tripping hazards as well as overloaded circuits will not be permitted.

- B. Unplug portable electrical hand tools when not in use. Inadvertent operation of equipment can take place if it is left plugged into an energized receptacle, and thereby create a hazard.
- C. Before maintaining or repairing any electrical equipment, it shall be disconnected from the power source.
- D. Do not use any equipment that has frayed cords or three-wire plugs that have had the grounding prongs removed. Faulty equipment and tools shall be repaired by qualified electrical personnel.
- E. Do not use metal ladders when working on electrical equipment.

120-1.8 SAFETY TAGGING AND LOCKOUT

No one may work on an energized circuit without written permission from the Contractor's Project Manager. The Contractor's Project Manager shall review the circumstances and the necessary safety precautions with the Engineer prior to giving permission for the "hot" work. The Contractor assumes all liability in connection with any work on energized circuits.

No one may disconnect or cause to be disconnected any electrical circuit before permission is requested from and granted by the Engineer.

Identification markings on light and power circuits shall not be relied on for established safe work conditions. Always verify the proper safe "de-energized" conditions with properly operating test equipment.

Before any circuit supplying radar, ILS, weather, runway/taxiway lighting equipment or any other equipment is disconnected, permission must first be granted by the Engineer. After permission is granted, the following requirements must be compiled with.

As a minimum, LOCK/TAG/TRY procedure shall comply with the Owner's requirements and NFPA 70E.

Work shall not commence on any circuit until:

1. The circuit is correctly identified in the presence of the Electrical Contractor's Superintendent or Foreman, Airport Electrical Maintenance Manager, or authorized representative, and Engineer.
2. After identity of the circuit is established, Electrical Maintenance Manager or authorized representative shall be notified, and the circuit disconnected. The time and date shall be recorded by the Engineer.
3. The switch shall be locked in the open position or opened in a manner, which will prevent accidental restoration.
4. The circuit shall be tagged with an approval red warning tag by the Electrical Contractor's Superintendent. The tag shall state, the Company's name, the Electricians name responsible for the disconnection, date and time and the project name and bid package number.

Restoration shall be accomplished, and tags removed only by the Electrical Contractor's Superintendent in the presence of the Electrical Maintenance Manager, or Engineer.

The Engineer shall record time, date and operational status of circuit after restoration.

Electrical circuits and apparatus shall be operated at these facilities only by qualified and authorized personnel.

No circuit shall be disconnected or unplugged before color code identification by taping.

No circuit shall be disconnected at power source before proper safety precautions are taken to prevent accidental restoration

When possible, circuits shall be restored by the same person who disconnected the circuit. When not possible, the Electrical Maintenance Manager or authorized representative shall perform restoration.

CONSTRUCTION METHODS

- (a) General. The Contractor shall install temporary runway or taxiway light fixtures, cable, and connectors at the approximate locations as shown on the plans, or as directed by the Engineer. The Engineer shall indicate specific locations.
- (b) Splicing methods and materials shall be subject to the joint approval of the cable manufacturer and the Engineer. Splicing methods and materials shall be the prime recommendation of the cable manufacturer. The Contractor shall submit copies of detailed splicing instructions to the Engineer for approval and shall use the approved methods and materials for all splicing work.
- (c) Airfield cable installed on the surface shall be protected by the Contractor. In areas where the Contractor's equipment or other vehicular traffic may be crossing, the Contractor shall provide protection to the cable in these areas in order to prevent damage to the cables.

METHOD OF MEASUREMENT

120-4.1 Temporary lighting shall be measured for payment as a lump sum of cable installed, to include furnishing and providing all materials to maintain the existing lighting circuits during the demolition operations. Materials include, but not limited to, base plates, conduit, cable, sandbags, break out rings, L-823 connectors, isolation transformer, frangible coupling, bolts, anchor bolts, light fixtures, conduit straps, shorting caps, fixture shroud, sign cover, timber and all labor and incidentals to complete the operation. This measurement shall include all measures required to maintain new or existing permanently installed fixtures for the duration of the project.

This line item should also include the effort required to cover and/or install blank panels of signage to prevent aircraft from being directed into closed construction areas per the phasing

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plans. Further, any obscuring of taxiway edge lights leading to closed areas of the airfield should be included both in materials/labor/equipment under this line item.

120-4.2 As noted in 120-1.3.F, as-built information for the airfield is not available regarding the circuiting. The contractor shall trace circuits impacted by construction – as shown on the Airfield Lighting Legend Sheet in the contract documents – such that effective jumpering can be completed for those construction phases requiring temporary cabling. Payment shall be made on a lump sum for all tracing efforts of noted circuits, and an as-built of the “pre-construction” condition shall be provided to the resident engineer for documentation prior to jumpering being completed for each phase.

As a standard for all contractors to be able to bid the time similarly with expectations for level of effort, we expect this quote should include 40 hours for a team of two electricians to dewater, trace and document the existing circuits in support of this effort. It is possible for additional funding to be available should the team of two require more time than the 80 hours indicated.

120-4.3 Subsurface utility investigation shall include all coordination and escorting by the contractor, and the delivery of the results of the subsurface utility investigation on communications and electrical infrastructure to the resident engineer.

BASIS OF PAYMENT

120-5.1 Payment will be made at the contract lump sum price for temporary lighting installed in place and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, restoration of the site around each light as shown on the Plans and for all labor, equipment, tools, and incidentals necessary to complete this item. Payment will be made under:

Item L-120-5.1	Temporary Lighting	- per Lump Sum
Item L-120-5.2	Circuit Investigation and Tracing	- per Lump Sum
Item L-120-5.3	Subsurface Utility Location	- per Lump Sum

END OF ITEM L-120

ITEM L-125 INSTALLATION OF AIRPORT LIGHTING SYSTEMS

DESCRIPTION

125-1.1 This item shall consist of airport lighting systems furnished and installed in accordance with this specification, the referenced specifications, and the applicable advisory circulars (ACs). The systems shall be installed at the locations and in accordance with the dimensions, design, and details shown in the plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the RPR.

EQUIPMENT AND MATERIALS

125-2.1 General.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified under the Airport Lighting Equipment Certification Program in accordance with AC 150/5345-53, current version. FAA certified airfield lighting shall be compatible with each other to perform in compliance with FAA criteria and the intended operation. If the Contractor provides equipment that does not perform as intended because of incompatibility with the system, the Contractor assumes all costs to correct the system for to operate properly.

b. Manufacturer's certifications shall not relieve the Contractor of their responsibility to provide materials in accordance with these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Clearly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be clearly made with arrows or circles (highlighting is not acceptable). The Contractor shall be responsible for delays in the project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be submitted in electronic PDF format, tabbed by specification section. The RPR reserves the right to reject any or all equipment, materials or procedures, which, in the RPR's opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12)

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months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

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125-2.2 Conduit/Duct. Conduit shall conform to Specification Item L-110 Airport Underground Electrical Duct Banks and Conduits.

125-2.3 Cable and Counterpoise. Cable and Counterpoise shall conform to Item L-108 Underground Power Cable for Airports.

125-2.4 Tape. Rubber and plastic electrical tapes shall be Scotch Electrical Tape Numbers 23 and 88 respectively, as manufactured by 3M Company or an approved equal.

125-2.5 Cable Connections. Cable Connections shall conform to Item L-108 Installation of Underground Cable for Airports.

125-2.6 Retroreflective Markers. Not required.

125-2.7 Runway and Taxiway Lights. Runway and taxiway lights shall conform to the requirements of AC 150/5345-46. Lamps shall be of size and type indicated, or as required by fixture manufacturer for each lighting fixture required under this contract. Filters shall be of colors conforming to the specification for the light concerned or to the standard referenced.

Type	Class	Mode	Style	Option	Base	Filter	Transformer	Notes
L-852C	2	1	2/3	5 (2 plugs/lamps)	L-868	Various	30/45W*	LED 12"
L-852D	2	1	2/3	5 (2 plugs/lamps)	L-868	Various	30/45W*	LED 12"
L-852G	2	1	2/3	n/a	L-868	Flashing Amber	45W	LED 12"
L-852S	2	1	2/3		L-868	Solid Red	45W	LED 12"
L-852T	2	1	n/a	n/a	L-868	Blue	45W	LED 12"
L-804	2	1	n/a	n/a	L-867	Flashing Yellow	100W	LED
L-861T	2	1	n/a	n/a	L-867	Blue	30/45W*	14" Tall LED
L-861	2	1	n/a	n/a	L-867	Various	45W	14" Tall LED

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Type	Class	Mode	Style	Option	Base	Filter	Transformer	Notes
L-862	2	1	n/a	n/a	L-867	Various	65W	14" Tall LED
L-862E	2	1	n/a	n/a	L-867	Various	30/45W	14" Tall LED

125-2.8 Runway and Taxiway Signs. Runway and Taxiway Guidance Signs should conform to the requirements of AC 150/5345-44. Signs shall be size 2, mode 2, style 5, and have a curved face in accordance with existing signs on the airfield. Signs shall have an external on/off switch and shall be externally labeled as noted on plans.

Panels provided for modifications to signs/closure of areas in support of phasing shall utilize panels capable of being installed on existing size 2 Lumacurve lighted airfield signs. Signs shall not exceed 100W transformer without authorization of engineer.

125-2.9 Runway End Identifier Light (REIL). Not required.

125-2.10 Precision Approach Path Indicator (PAPI). Not required.

125-2.11 Circuit Selector Cabinet. Not required.

125-2.12 Light Base and Transformer Housings. Light Base and Transformer Housings should conform to the requirements of AC 150/5345-42. Light bases shall be Type L-867 and L-868, Class 1A, Size B, and shall be provided as indicated or as required to accommodate the fixture or device installed thereon. Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures.

125-2.13 Isolation Transformers. Isolation Transformers shall be Type L-830, size as required for each installation. Transformer shall conform to AC 150/5345-47.

INSTALLATION

125-3.1 Installation. The Contractor shall furnish, install, connect and test all equipment, accessories, conduit, cables, wires, buses, grounds and support items necessary to ensure a complete and operable airport lighting system as specified here and shown in the plans.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and state and local code agencies having jurisdiction.

The Contractor shall install the specified equipment in accordance with the applicable advisory circulars and the details shown on the plans.

125-3.2 Testing. All lights shall be fully tested by continuous operation for not less than 24 hours as a completed system prior to acceptance. The test shall include operating the constant current regulator in each step not less than 10 times at the beginning and end of the 24-hour test. The fixtures shall illuminate properly during each portion of the test.

125-3.3 Shipping and Storage. Equipment shall be shipped in suitable packing material to prevent damage during shipping. Store and maintain equipment and materials in areas protected from weather and physical damage. Any equipment and materials, in the opinion of

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the RPR, damaged during construction or storage shall be replaced by the Contractor at no additional cost to the owner. Painted or galvanized surfaces that are damaged shall be repaired in accordance with the manufacturer's recommendations.

125-3.4 Elevated and In-pavement Lights. Water, debris, and other foreign substances shall be removed prior to installing fixture base and light.

A jig or holding device shall be used when installing each light fixture to ensure positioning to the proper elevation, alignment, level control, and azimuth control. Light fixtures shall be oriented with the light beams parallel to the runway or taxiway centerline and facing in the required direction. The outermost edge of fixture shall be level with the surrounding pavement. Surplus sealant or flexible embedding material shall be removed. The holding device shall remain in place until sealant has reached its initial set.

~~**125-3.5 Breakage fixtures.** The Contractor shall supply additional 'breakage' lighting fixtures as part of the project. Breakage fixtures shall include fixture assembly, stem, L-823 connector and frangible coupling. Fixture assemblies shall be turned over to the airport and stored at a location as directed by the Resident Engineer. Total quantity of fixtures to be supplied is 10% of each light fixture and color pattern, while a minimum of one additional fixture is required for each color pattern/presentation type (e.g. L-861T, L-852C green/green, L-852C yellow/yellow, L-852D green/green, etc.) unless otherwise listed on the Contract Drawings.~~

~~**125-3.6 Steel Covers.** Steel covers shall be load bearing 3/4" thick FAA approved covers for L-868B base cans, and 3/8" thick FAA approved covers for L-867B base cans.~~

METHOD OF MEASUREMENT

125-4.1 Steel cover plates will be measured by the number of base plates installed and approved by the RPR, including all ancillary items such as grounding and bolting hardware. Should any cable connections be required as a part of the steel cover plate installation, that cable connection shall be incidental to the steel plate installation.

Runway and taxiway lights will be measured by the number of each type installed as completed units in place, including ancillary items such as new isolation transformer, gaskets as needed, hardware and grounding connections, ready for operation, and accepted by the RPR.

Guidance signs and any message modifications will be measured by the number of each completed messages per sign cabinet, installed as completed units, in place, ready for operation, and accepted by the RPR. The existing guidance signs are LED-powered Lumacurve/Standard Signs, Size 2.

125-4.2 The MALSR Light Bar shall include demolition and disposal of all old equipment, as well as the construction of new foundations, conduit, EMT steel pipe, lights, grounding, and all other items shown on electrical plan sheets to construct and install a functioning MALSR light station as accepted by the RPR.

BASIS OF PAYMENT

125-5.1 Payment will be made at the Contract unit price for each complete base plate, runway or taxiway light, or guidance sign panel modification, installed by the Contractor and accepted

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by the RPR. This payment will be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools and incidentals necessary to complete this item.

Payment will be made under:

- L-125-5.1 Install New 3/8" Steel Plate on Existing L-867 Base Can - per each
- L-125-5.2 Install New 3/4" Steel Plate on Existing L-868 Base Can - per each
- L-125-5.3 Install New L-861T(L) LED Taxiway Edge Light on New L-867 Base Can in Turf - per each
- L-125-5.4 Install New L-861T(L) LED Taxiway Edge Light on New L-867 Base Can in Shoulder Pavement - per each
- L-125-5.5 Install New L-861T(L) LED Taxiway Edge Light on an Existing L-867 Base Can - per each
- L-125-5.6 Install New L-861(L) LED Medium Intensity Runway Edge Light on New L-867 Base Can in Shoulder Pavement - per each**
- L-125-5.7 Install New L-862(L) LED High Intensity Runway Edge Light on New L-867 Base Can in Shoulder Pavement - per each**
- L-125-5.8 Install New L-862E(L) LED High Intensity Runway End/Threshold Light on New L-867B Base Can in New Shoulder Pavement - per each**
- L-125-5.9 Install New L-862E(L) LED High Intensity Runway End/Threshold Light on New L-867B Base Can Cored into Existing Blast Pad Pavement - per each**
- L-125-5.10 Install New L-862E(L) LED High Intensity Runway End/Threshold Light on Existing L-867B Base Can - per each**
- L-125-5.11 Install New L-852C/D(L) LED Taxiway Centerline Light on New L-868 Base Can in New Full Strength Taxiway Pavement - per each
- L-125-5.12 Install New L-852C/D(L) LED Taxiway Centerline Light on New L-868 Base Can in New Full Strength Runway Pavement - per each
- L-125-5.13 Install New L-852G(L) LED In-Pavement Runway Guard Light on New L-868 Base Can in New Full Strength Pavement - per each
- L-125-5.14 Install New L-852T(L) LED In-Pavement Taxiway Edge Light on New L-868 Base Can in Existing Full Strength Pavement - per each
- L-125-5.15 Install New L-858(L) LED Airfield Lighting Sign, 1 Module, on New Foundation – per each
- L-125-5.16 Install New L-858(L) LED Airfield Lighting Sign, 2 Module, on New Foundation – per each
- L-125-5.17 Install New L-858(L) LED Airfield Lighting Sign, 3 Module, on New Foundation – per each
- L-125-5.18 Install New L-858(L) LED Airfield Lighting Sign, 4 Module, on New Foundation – per each

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- L-125-5.19 Install New L-804(L) Elevated Runway Guard Lights on New L-867 Base Can in Turf – per each
- L-125-5.20 Install New L-852S(L) In-Pavement Runway Stop Bar Lights on New L-868 Base Can in Full Strength Pavement – per each
- L-125-5.21 Install MALSR Light Bar (5 EMT-Mounted Lights) – per lump sum
- ~~L-125-5.22 10% Breakage Quantity – per lump sum~~

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

- | | |
|----------------|--|
| AC 150/5340-18 | Standards for Airport Sign Systems |
| AC 150/5340-26 | Maintenance of Airport Visual Aid Facilities |
| AC 150/5340-30 | Design and Installation Details for Airport Visual Aids |
| AC 150/5345-5 | Circuit Selector Switch |
| AC 150/5345-7 | Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits |
| AC 150/5345-26 | Specification for L-823 Plug and Receptacle, Cable Connectors |
| AC 150/5345-28 | Precision Approach Path Indicator (PAPI) Systems |
| AC 150/5345-39 | Specification for L-853, Runway and Taxiway Retroreflective Markers |
| AC 150/5345-42 | Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories |
| AC 150/5345-44 | Specification for Runway and Taxiway Signs |
| AC 150/5345-46 | Specification for Runway and Taxiway Light Fixtures |
| AC 150/5345-47 | Specification for Series to Series Isolation Transformers for Airport Lighting Systems |
| AC 150/5345-51 | Specification for Discharge-Type Flashing Light Equipment |
| AC 150/5345-53 | Airport Lighting Equipment Certification Program |

Engineering Brief (EB)

- | | |
|-----------|---|
| EB No. 67 | Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures |
|-----------|---|

END OF ITEM L-125

Item L-125 INSTALLATION OF
AIRPORT LIGHTING SYSTEMS L-125-6
CITY OF HOUSTON AIRPORT SYSTEM
WILLIAM P. HOBBY AIRPORT
FAA NON-STANDARD TAXIWAYS PROJECT

ISSUED FOR BID
HAS NO. 770
APRIL 11, 2023

EXISTING AIRFIELD ELECTRICAL LEGEND	
SYMBOL	DESCRIPTION
	EXISTING CONDUIT IN PAVEMENT OR TURF
	EXISTING POWER DUCTBANK
	EXISTING POWER MANHOLE
	EXISTING HANDHOLE
	EXISTING JUNCTION CAN
	EXISTING AIRFIELD LIGHT CAN
	EXISTING AIRFIELD SIGN

AIRFIELD ELECTRICAL DEMOLITION LEGEND	
SYMBOL	DESCRIPTION
	EXISTING CONDUIT TO BE REMOVED
	EXISTING TAXIWAY EDGE LIGHT AND BASE CAN TO BE REMOVED
	EXISTING RUNWAY EDGE LIGHT, IN-PVMT HOLD LIGHT AND BASE CAN TO BE REMOVED
	INSTALL NEW STEEL COVER ON EXISTING LIGHT CAN
	INSTALL NEW STEEL COVER ON EXISTING LIGHT CAN TO RETAIN CIRCUIT
	EXISTING AIRFIELD SIGN AND FOUNDATION TO BE REMOVED
	EXISTING RUNWAY END LIGHTS AND BASE CAN TO BE REMOVED
	EXISTING HANDHOLE TO BE REMOVED
	EXISTING MANHOLE TO BE REMOVED
	INSTALL CONDUIT END CAP AND PULL STRING
	PAVEMENT DEMOLITION

AIRFIELD ELECTRICAL LEGEND		
SPECIFICATION SECTION	SYMBOL	DESCRIPTION
L-125		INSTALL L-850C(L), BI-DIRECTIONAL, CLEAR/CLEAR OR CLEAR/AMBER, LED IN-PAVEMENT R/W EDGE LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW L-868, SIZE B BASE CAN. C = CLEAR, Y = YELLOW. NO DESIGNATION INDICATES CLEAR/CLEAR.
L-125		INSTALL L-861(L), BI-DIRECTIONAL, CLEAR/AMBER, LED R/W EDGE LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW L-868, SIZE B BASE CAN. C = CLEAR, Y = YELLOW. NO DESIGNATION INDICATES CLEAR/CLEAR.
L-125		INSTALL L-862(L), ELEVATED LED R/W EDGE LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW ADJUSTABLE DEPTH L-867, SIZE B BASE CAN. C = CLEAR, Y = YELLOW. NO DESIGNATION INDICATES CLEAR/CLEAR.
L-125		INSTALL L-862E(L), BI-DIRECTIONAL, GREEN/RED, ELEVATED LED R/W THRESHOLD/END LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW ADJUSTABLE DEPTH L-867, SIZE B BASE CAN.
L-125		INSTALL L-862E(L), BI-DIRECTIONAL, RED/RED, ELEVATED LED R/W THRESHOLD/END LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW ADJUSTABLE DEPTH L-867, SIZE B BASE CAN.
L-125		INSTALL L-852C/D(L), IN-PAVEMENT BI-DIRECTIONAL, GREEN/GREEN LED T/W CENTERLINE LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW L-868, SIZE B BASE CAN. SMALL SOLID AREA DENOTES DIRECTION OF LIGHT BEAM.
L-125		INSTALL L-804(L), LED ELEVATED R/W GUARD LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-867 CONNECTOR KIT. MOUNTED ON A NEW L-868, SIZE B BASE CAN.
L-125		INSTALL L-852G(L), LED R/W IN-PAVEMENT GUARD LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW L-868, SIZE B BASE CAN.
L-125		INSTALL L-852S(L), LED R/W IN-PAVEMENT STOP BAR LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW L-868, SIZE B BASE CAN.
L-125		INSTALL L-861(L), ELEVATED LED T/W EDGE LIGHT, OVERALL HEIGHT 14", WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. MOUNTED ON A NEW L-867, SIZE B BASE CAN.
L-125		INSTALL L-852T(L), IN-PAVEMENT LED T/W EDGE LIGHT WITHOUT HEATER KIT AND PROPERLY SIZED ISOLATION TRANSFORMER ON A NEW L-868B BASE CAN IN EXISTING SHOULDER PAVEMENT.
L-125		SN01 185 SIGN ID NUMBER, SEE SHEET EL501 FOR SIGN TABLE. INSTALL L-858(L) LED, AIRFIELD GUIDANCE SIGN, MOUNTED ON A CONCRETE FOUNDATION WITH AN L-867, SIZE B, 24" DEEP BASE CAN, WITH PROPERLY SIZED ISOLATION TRANSFORMER AND L-823 CONNECTOR KIT. SN01 REPRESENTS SIGN NUMBER. RE-PURPOSED HOU SIGN NUMBER, SEE SHEET EL501 FOR SIGN TABLE.
L-125		TYPICAL SIGN LEGENDS
L-108		CIRCUIT DESIGNATIONS AS SHOWN ON PLANS FAA CABLES SHALL NOT HAVE SPLICES EXCEPT AT POINTS OF TERMINATION UNLESS NOTED OTHERWISE.
L-110		INSTALL ONE-WAY, TWO-INCH PVC SCHEDULE 40, UNLESS NOTED OTHERWISE, CONCRETE ENCASED UNDER PAVEMENT AND EXTERNAL 1/0 #16 AWG SOLID TINNED SOFT DRAWN COPPER COUNTERPOISE WIRE. NUMBER SHOWN INDICATES NUMBER OF CONDUITS IN DUCTBANK.
L-110		INSTALL SCHEDULE 40 PVC DUCTBANK, SIZE AS SHOWN, CONCRETE ENCASED UNDER PAVEMENT AND EXTERNAL 1/0 #1/0 AWG BARE GUARD WIRE.
L-110		INSTALL 2" PVC DRAIN LINE FOR ELECTRICAL STRUCTURES
L-110		CONNECT AND INSTALL BACKFLOW PREVENTER IN STORM WATER STRUCTURE
L-115		INSTALL L-867 BASE CAN IN TURF, SHOULDER PAVEMENT OR L-868 BASE CAN IN FULL STRENGTH PAVEMENT AS NOTED ON THE PLANS.
L-115		INSTALL AIRCRAFT-RATED ELECTRICAL MANHOLE.
L-115		INSTALL AIRCRAFT-RATED ELECTRICAL OR COMMUNICATION HANDHOLE.
L-115		INSTALL AIRCRAFT-RATED FAA ELECTRICAL HANDHOLE.

CIRCUIT TABLE		
AS SHOWN ON PLANS	CIRCUIT COVERAGE	VAULT LOCATION:
TW D/E	TAXIWAY D AND E EDGE LIGHTS	NORTH VAULT
TW G/F	TAXIWAY G, G1, G2, G3, AND F EDGE LIGHTS	NORTH VAULT
TW K CL	TAXIWAY K CENTERLINE LIGHTS	SOUTH VAULT
TW K CL (SMGCS)	TAXIWAY K CENTERLINE SMGCS LIGHTS	SOUTH VAULT
TW K	TAXIWAY K, K1, K2, R EDGE LIGHTS	SOUTH VAULT
TW M	TAXIWAY M, M1, M3 EDGE LIGHTS	NORTH VAULT
SC-NW	SIGN CIRCUIT - NW QUADRANT	NORTH VAULT
SC-SW	SIGN CIRCUIT - SW QUADRANT	SOUTH VAULT
RGL-NW	RUNWAY GUARD LIGHTS - NW QUADRANT	NORTH VAULT
RGL-SW	RUNWAY GUARD LIGHTS - SW QUADRANT	SOUTH VAULT
RW 13R-31L EDGE	RUNWAY 13R-31L EDGE LIGHTS	NORTH VAULT
RW 13L-31R EDGE	RUNWAY 13L-31R EDGE LIGHTS	NORTH VAULT
RW 4-22 EDGE	RUNWAY 4-22 EDGE LIGHTS	SOUTH VAULT

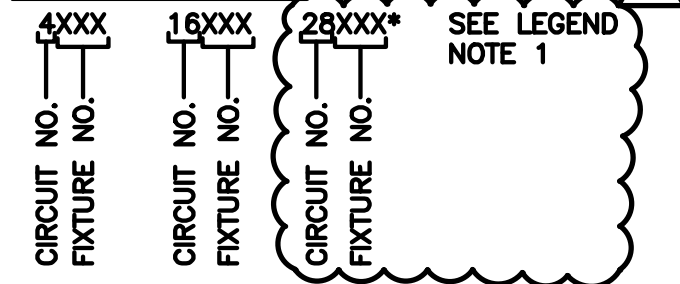
GENERAL NOTES:

- ALL WORK, EQUIPMENT AND MATERIALS MUST COMPLY WITH FAA REQUIREMENTS, NFPA 70, ANSI C2, HOUSTON AIRPORT SYSTEM, AND THE CITY OF HOUSTON BUILDING CODE.
- PROVIDE ALL LABOR, PARTS AND MATERIAL REQUIRED FOR A COMPLETE, PROPERLY WORKING ELECTRICAL LIGHTING AND SIGNAGE SYSTEM AS DESCRIBED AND INDICATED.
- ALL WORK SHALL BE PERFORMED DURING AIRPORT OPERATING CONDITIONS AND AS SCHEDULED BY HOUSTON AIRPORT SYSTEMS OPERATIONS. UNLESS OTHERWISE INDICATED, ALL SIGNS AND LIGHTING SYSTEMS SHALL BE READY FOR USE EVERY NIGHT AND FOR EVERY LOW VISIBILITY PERIOD EXCEPT AS SHOWN AS CLOSED IN THE PHASING DRAWINGS.
- NOTIFY ENGINEER OF ANY SIGNIFICANT DIFFERENCES BETWEEN DRAWINGS AND FIELD CONDITIONS. DEVIATIONS, PARTICULARLY REGARDING CIRCUIT ROUTING, ARE ANTICIPATED AND WILL REQUIRE COORDINATION WITH THE RESIDENT PROJECT REPRESENTATIVE.
- PROVIDE REINFORCING FOR CONCRETE ENCASED DUCT BANKS UNDER FULL-STRENGTH RUNWAY AND TAXIWAY PAVEMENT. EXTEND REINFORCEMENT 5' BEYOND EDGE OF PAVEMENT FOR DUCTBANKS ONLY.
- ALL REMOVED/DEMOLISHED ITEMS SHALL HAVE THEIR ASSOCIATED BASE CANS AND/OR FOUNDATIONS REMOVED AS WELL, BACKFILL OF THE VOID CREATED TO GRADE IS INCIDENTAL TO THE DEMOLITION ITEM.
- COORDINATE WITH H.A.S. STAFF TO LOCK OUT/TAG OUT APPROPRIATE C.C.R. PRIOR TO WORKING ON AIRFIELD CIRCUITING.
- UNLESS OTHERWISE NOTED, ALL MATERIALS INSTALLED AS A PART OF THE PROJECT SHALL BE NEW.
- THE COST OF CONNECTING DUCTBANKS FOR CONDUITS INTO EXISTING STRUCTURES OR BASECANS TO REMAIN SHALL BE INCIDENTAL TO THE DUCTBANK OR CONDUIT INSTALLATION LINE ITEM.

NORTH VAULT CIRCUIT LEGEND:

- 13R-31L TDZ1(2)
- 13R-31L TDZ2(2)
- 13R-31L CENTERLINE(2)
- 13R-31L EDGE(2)
- TW M/M1/M3 EDGE(2)
- TW G/F EDGE(2)
- TW D/E EDGE(2)
- TW M1/M3 CENTERLINE(2)
- TW H CENTERLINE(2)
- TW H CENTERLINE SMGCS(2)
- TW H EDGE(2)
- TW Z CENTERLINE1(2)
- TW Z CENTERLINE2(2)
- TW Y/Z CENTERLINE SMGCS(2)
- TW Y CENTERLINE(2)
- RGL NW(2)
- RGL NE(2)
- SIGNS NW(2)
- SIGNS NE(2)

LEGEND:



LEGEND NOTE:

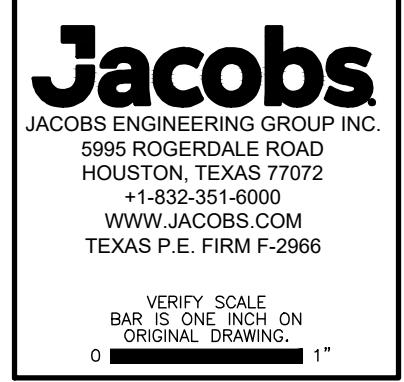
- ANY FIXTURE WITH AN ASTERISK AFTER IT REQUIRES A CONCRETE BOXOUT. COORDINATE WITH CIVIL FOR THIS INSTALLATION.

BREAKAGE QUANTITY BREAKDOWN:

Pay Item Number	Spec Number	Item	Color	Quantity to be provided (10%)	Material Required
L-125-5.3, 5.4, 5.5	L-861(L)	LED Elevated Taxiway Edge Light	Blue	24	Light fixture, stem, baseplate, isolation transformer, L-823 connector and frangible coupling.
L-125-5.6	L-861(L)	LED Elevated Runway Edge Light (Medium Intensity)	White/Amber	1	Light fixture, stem, baseplate, isolation transformer, L-823 connector and frangible coupling.
L-125-5.7	L-862(L)	LED Elevated Runway Edge Light (High Intensity)	White/Amber (Left Toe)	1	Light fixture, stem, baseplate, isolation transformer, L-823 connector and frangible coupling.
			White/Amber (Right Toe)	1	Light fixture, stem, baseplate, isolation transformer, L-823 connector and frangible coupling.
L-125-5.8, 5.9	L-862E(L)	LED Elevated Runway Threshold Light (High Intensity)	Red/Red (No Toe)	1	Light fixture, stem, baseplate, isolation transformer, L-823 connector and frangible coupling.
			Red/Green (Green Left Toe)	1	Light fixture, stem, baseplate, isolation transformer, L-823 connector and frangible coupling.
			Red/Green (Green Right Toe)	1	Light fixture, stem, baseplate, isolation transformer, L-823 connector and frangible coupling.
L-125-5.11, 5.12	L-852C(L)	LED In-Pavement Taxiway Centerline Light (Narrow)	Green/Green	1	Complete Light Housing (including light engine), Isolation Transformer, L-823 connectors and bolts.
			Yellow/Yellow	1	Complete Light Housing (including light engine), Isolation Transformer, L-823 connectors and bolts.
			Green/Yellow	1	Complete Light Housing (including light engine), Isolation Transformer, L-823 connectors and bolts.
	L-852D(L)	LED In-Pavement Taxiway Centerline Light (Wide)	Green/Green	2	Complete Light Housing (including light engine), Isolation Transformer, L-823 connectors and bolts.
			Yellow/Yellow	1	Complete Light Housing (including light engine), Isolation Transformer, L-823 connectors and bolts.
L-125-5.13	L-852G(L)	LED In-Pavement Runway Guard Light	Yellow/Yellow	4	Complete Light Housing (including light engine), Isolation Transformer, L-823 connectors and bolts.
L-125-5.14	L-852T(L)	LED In-Pavement Taxiway Edge Light	Blue	1	Complete Light Housing (including light engine), Isolation Transformer, L-823 connectors and bolts.
L-125-5.15	L-858(L)	LED Airfield Signage, 1 Module	N/A	1	No Cabinets, but light engines for 1 module sign, any circuit boards, isolation transformers.
L-125-5.16	L-858(L)	LED Airfield Signage, 2 Module	N/A	1	No Cabinets, but light engines for 2 module sign, any circuit boards, isolation transformers.
L-125-5.17	L-858(L)	LED Airfield Signage, 3 Module	N/A	1	No Cabinets, but light engines for 3 module sign, any circuit boards, isolation transformers.
L-125-5.18	L-858(L)	LED Airfield Signage, 4 Module	N/A	1	No Cabinets, but light engines for 4 module sign, any circuit boards, isolation transformers.
L-125-5.19	L-804(L)	LED Elevated Runway Guard Light	Yellow/Yellow	1	Light fixture, stem, heavy duty baseplate, isolation transformer, L-823 connectors.
L-125-5.20	L-852S(L)	LED In-Pavement Runway Stop Bar Light	Red	2	Complete Light Housing (including light engine), Isolation Transformer, L-823 connectors

BREAKAGE EQUIPMENT NOTES:

- THE CONTRACTOR SHALL SUPPLY ADDITIONAL 'BREAKAGE' LIGHTING FIXTURES AS PART OF THE PROJECT, INCIDENTAL TO THE CONTRACT COST FOR L-858 SIGNAGE AND L-85X/L-86X/L-80X LIGHTING FIXTURES AS PROVIDED IN THE TABLE ON THIS SHEET.
- FOR LIGHTS, BREAKAGE FIXTURES SHALL INCLUDE FIXTURE ASSEMBLY, STEM, L-823 CONNECTOR, L-830 ISOLATION TRANSFORMER, AND FRANGIBLE COUPLING. IN-PAVEMENT LIGHTS SHALL PROVIDE HOUSING, PRISM (OR EQUIVALENT LIGHT ENGINE), L-823 CONNECTOR, AND COATED BOLTS.
- FOR SIGNS, THE BREAKAGE EQUIPMENT SHALL BE COMPRISED OF SIGN ELEMENTS INCLUDING LIGHT ENGINES, ANY CIRCUIT BOARDS REQUIRED, AND ANY ASSOCIATED L-830 ISOLATION TRANSFORMERS.
- BREAKAGE EQUIPMENT SHALL BE TURNED OVER TO THE AIRPORT AND STORED AT A LOCATION AS DIRECTED BY THE RESIDENT ENGINEER.
- FOR CLARITY, THE TOTAL QUANTITY OF FIXTURES TO BE SUPPLIED IS 10% OF EACH LIGHT FIXTURE AND COLOR PATTERN, WHILE A MINIMUM OF ONE FIXTURE IS REQUIRED FOR EACH COLOR PATTERN/PRESENTATION TYPE (E.G. L-861T, L-852C GREEN/GREEN, L-852C YELLOW/YELLOW, L-852D GREEN/GREEN, ETC.) UNLESS OTHERWISE LISTED ON THE CONTRACT DRAWINGS.



REVISIONS			
NO.	DESCRIPTION	DATE	BY
0	ISSUED FOR BO	02/24/2023	SC
1	ADDENDUM 1	03/23/2023	ND
2	ADDENDUM 2	04/11/2023	ND

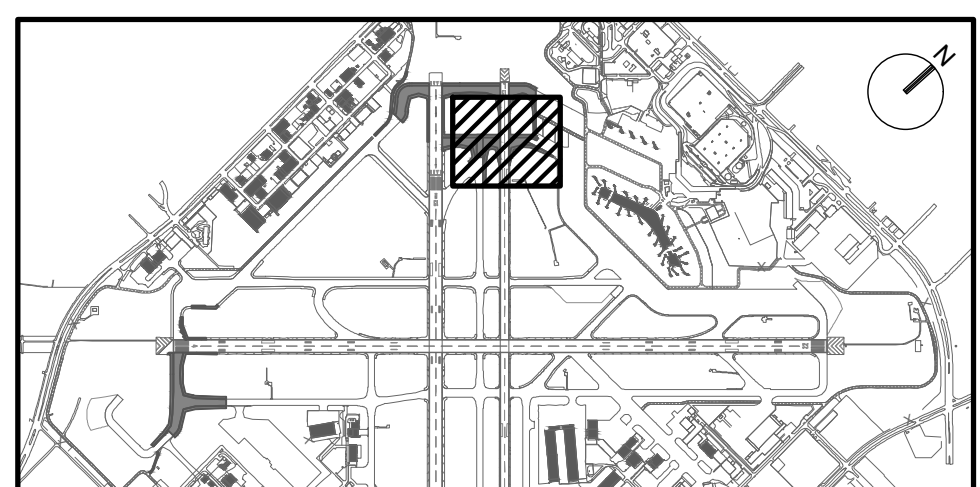
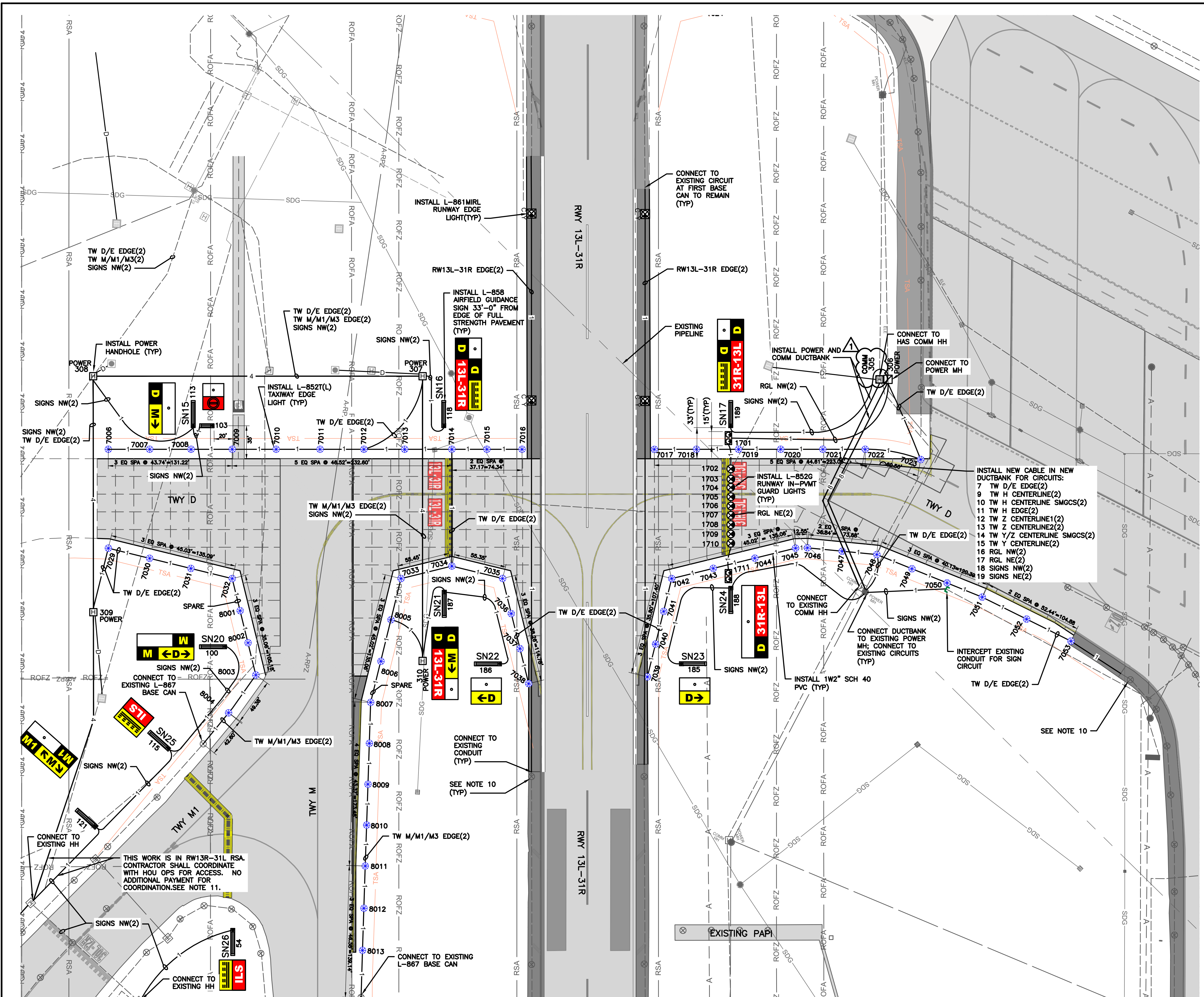
FAA NON-STANDARD TAXIWAYS PROJECT
 AIRFIELD ELECTRICAL NOTES AND LEGENDS

PROJECT MGR:	
DESIGNER:	N. DERES
DRAWN BY:	K. ALMOND
CHECKED BY:	
SCALE:	AS SHOWN
DATE:	04/11/2023



APPROVED BY: _____ DATE: _____
 DIRECTOR
 HOUSTON AIRPORT SYSTEM

PROJECT NO:	770
C.I.P. NO:	3-48-0110-044
H.A.S. NO:	N/A
SHEET NO:	E-001



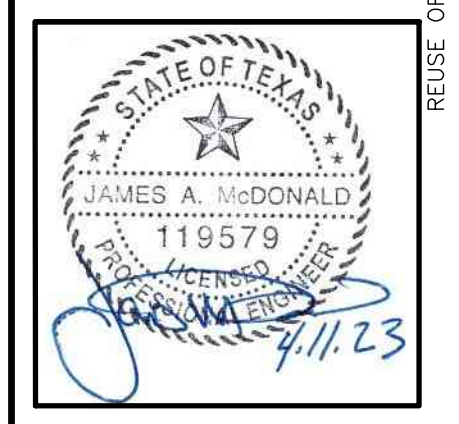
KEY MAP
NTS

NOTES:

- FOR AIRFIELD ELECTRICAL LEGEND, SEE SHEET E-001.
- FOR REPAVELING SIGN TABLE, SEE SHEET EL501.
- CONTRACTOR TO INSTALL CURVED FACE, LED AIRFIELD SIGNS, SIZE 2. NEW SIGNS SHALL HAVE POWER LEG WHERE CABLES ENTER SIGN, EXTERNAL ON/OFF SWITCH AND SIGN NUMBER AFFIXED TO SHORT END OF SIGN FACING TAXIWAY.
- IF A SIGN BEING REMOVED IN DEMOLITION IS PART OF A 'PASS THROUGH' FOR THE CIRCUIT, THE CONTRACTOR SHALL INSTALL A NEW L-867 JUNCTION CAN IN ITS PLACE AND REPLACE THE CIRCUIT BACK TO THE NEAREST JUNCTION POINT ON EITHER SIDE OF THE JUNCTION CAN.
- EXTEND EXISTING CONDUIT INTO NEW L-867B BASE.
- CONNECT TO EXISTING L-867 BASE CAN.
- CONTRACTOR SHALL ENLIST MANUFACTURERS OF EXISTING AIRFIELD LIGHTING CONTROL AND MONITORING SYSTEM (ALCMS) TO PERFORM GRAPHICAL CHANGES AS REQUIRED. SEE SPECIFICATIONS FOR DETAILS.
- ALL NEW POWER AND COMMUNICATION MANHOLES AND HANDHOLES SHALL BE DRAINED BY A 2" MINIMUM PVC PIPE TO THE NEAREST STORM WATER CATCH-BASIN. DRAIN PIPES SHALL BE EQUIPPED WITH A BACKFLOW FLAP DEVICE AS SHOWN IN THE DETAILS.
- CONTRACTOR SHALL COVER ANY PART OF A SIGN LEADING TO A CLOSED AREA IN A METHOD APPROVED BY HOU OPERATIONS.
- CONTRACTOR SHALL CONNECT CIRCUIT IN CLOSEST EXISTING BASECAN TO REMAIN (TYP).
- WORK AREA LIMITS INDICATE THE PRIMARY LIMITS OF THE PERMANENT WORK TO BE CONSTRUCTED IN EACH PHASE. ADDITIONAL PERMANENT AND TEMPORARY WORK OUTSIDE OF THE WORK AREA LIMITS IS REQUIRED IN SOME CASES/PHASES. WORK OUTSIDE THE WORK AREA LIMITS SHOWN SHALL BE COORDINATED WITH HOU AIRPORT OPERATIONS A MINIMUM OF 7 BUSINESS DAYS IN ADVANCE. ANY ADDITIONAL BARRICADES REQUIRED TO PERFORM THIS WORK SHALL BE CONSIDERED INCIDENTAL TO OTHER PROJECT WORK.

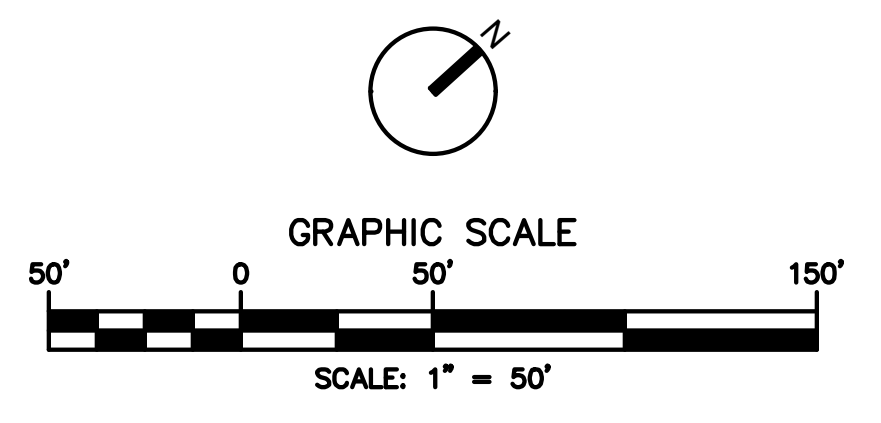
FAA NON-STANDARD TAXIWAYS PROJECT
AIRFIELD ELECTRICAL LIGHTING & SIGNAGE PLAN
— PHASE 1

PROJECT MGR: _____
 DESIGNER: N. DERES
 DRAWN BY: K. ALMOND
 CHECKED BY: _____
 SCALE: AS SHOWN
 DATE: 04/11/2023

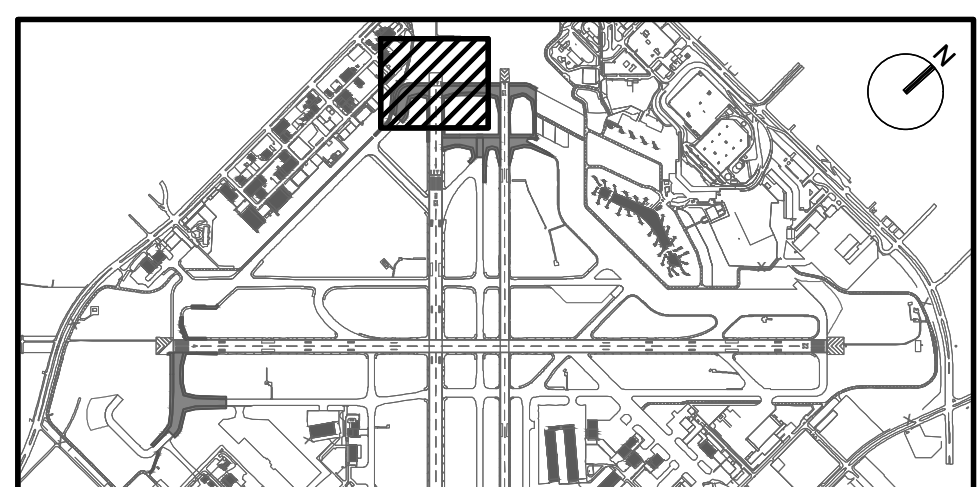
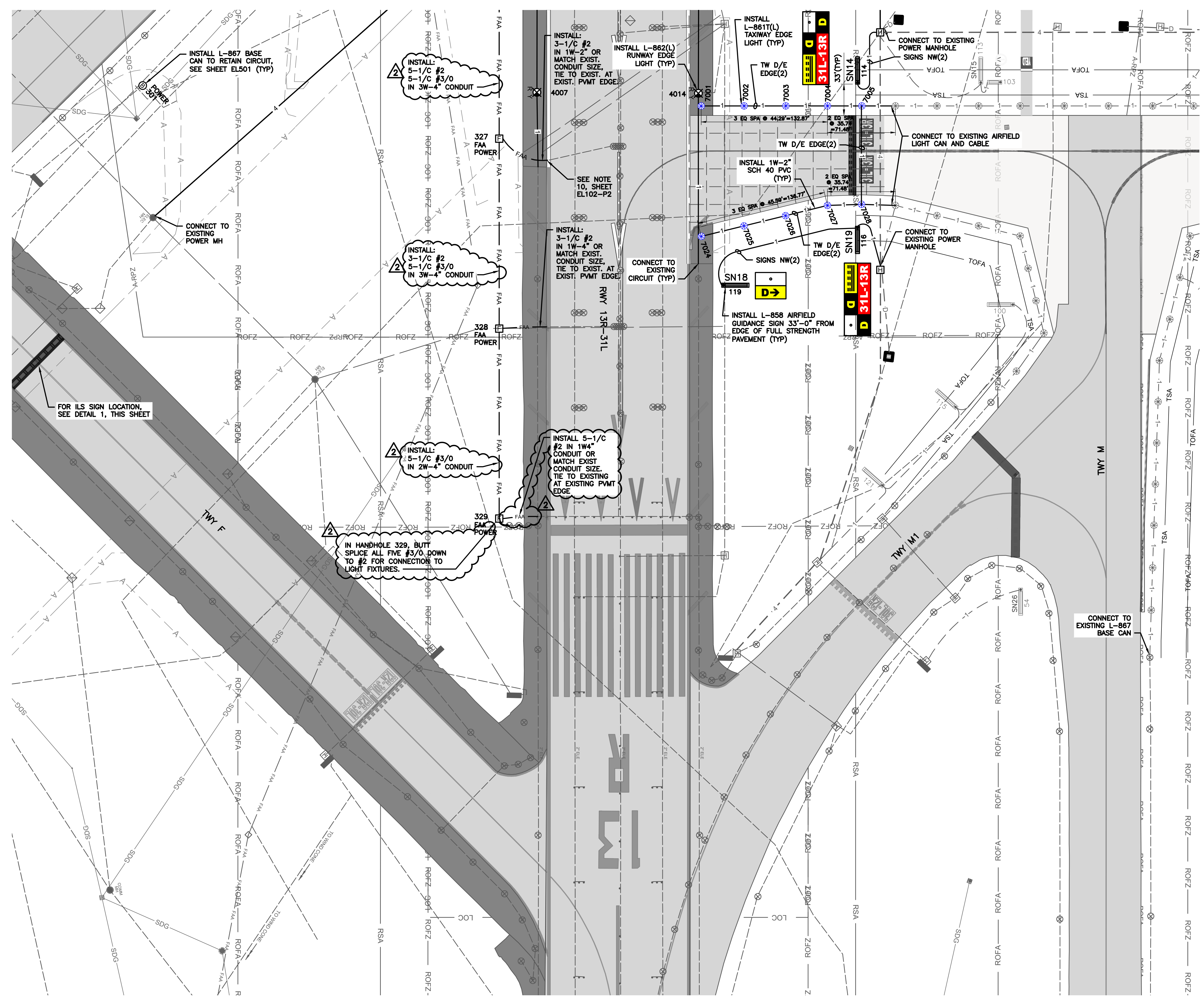


APPROVED BY: _____ DATE: _____
 DIRECTOR
 HOUSTON AIRPORT SYSTEM

PROJECT NO: 770
 C.I.P. NO: 3-48-0110-044
 H.A.S. NO: N/A
 SHEET NO: EL101-P1
 of



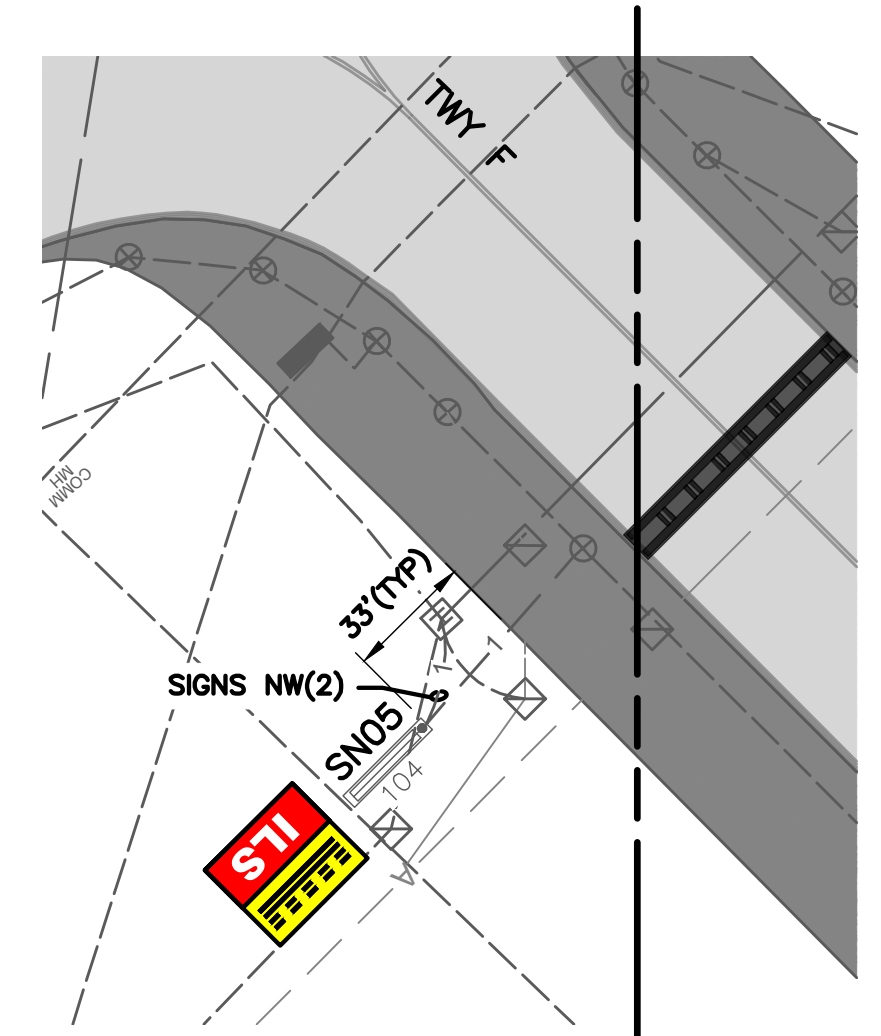
THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF JACOBS AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF JACOBS.



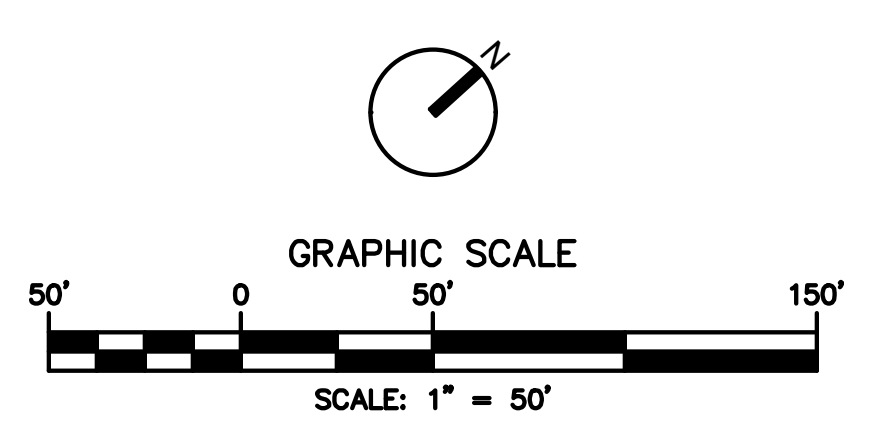
KEY MAP
NTS

NOTES:

- FOR AIRFIELD ELECTRICAL LEGEND, SEE SHEET E-001.
- FOR REPAANELING SIGN TABLE, SEE SHEET EL501.
- CONTRACTOR TO INSTALL CURVED FACE, LED AIRFIELD SIGNS, SIZE 2. NEW SIGNS SHALL HAVE POWER LEG WHERE CABLES ENTER SIGN, EXTERNAL ON/OFF SWITCH AND SIGN NUMBER AFFIXED TO SHORT END OF SIGN FACING TAXIWAY.
- IF A SIGN BEING REMOVED IN DEMOLITION IS PART OF A 'PASS THROUGH' FOR THE CIRCUIT, THE CONTRACTOR SHALL INSTALL A NEW L-867 JUNCTION CAN IN ITS PLACE AND REPLACE THE CIRCUIT BACK TO THE NEAREST JUNCTION POINT ON EITHER SIDE OF THE JUNCTION CAN.
- EXTEND EXISTING CONDUIT INTO NEW L-867B BASE.
- CONNECT TO EXISTING L-867 BASE CAN.
- CONTRACTOR SHALL ENLIST MANUFACTURERS OF EXISTING AIRFIELD LIGHTING CONTROL AND MONITORING SYSTEM (ALCMS) TO PERFORM GRAPHICAL CHANGES AS REQUIRED. SEE SPECIFICATIONS FOR DETAILS.
- CONTRACTOR SHALL CONNECT CIRCUIT IN CLOSEST EXISTING BASECAN TO REMAIN (TYP).



1 ILS SIGN LOCATION
NTS



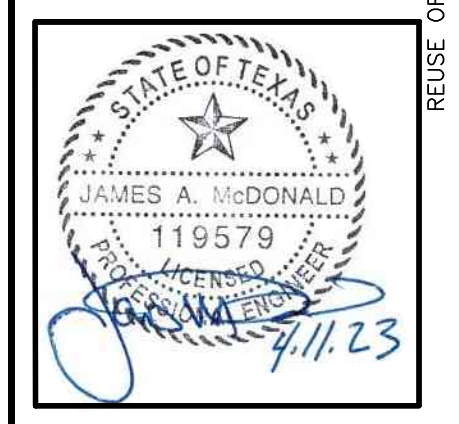
Jacobs
JACOBS ENGINEERING GROUP INC.
5995 ROGERDALE ROAD
HOUSTON, TEXAS 77072
+1-832-351-6000
WWW.JACOBS.COM
TEXAS P.E. FIRM F-2966

REVISIONS

NO.	DESCRIPTION	DATE	BY
0	ISSUED FOR BID	02/24/2023	SC
1	ADDENDUM 1	03/23/2023	ND
2	ADDENDUM 2	04/11/2023	ND

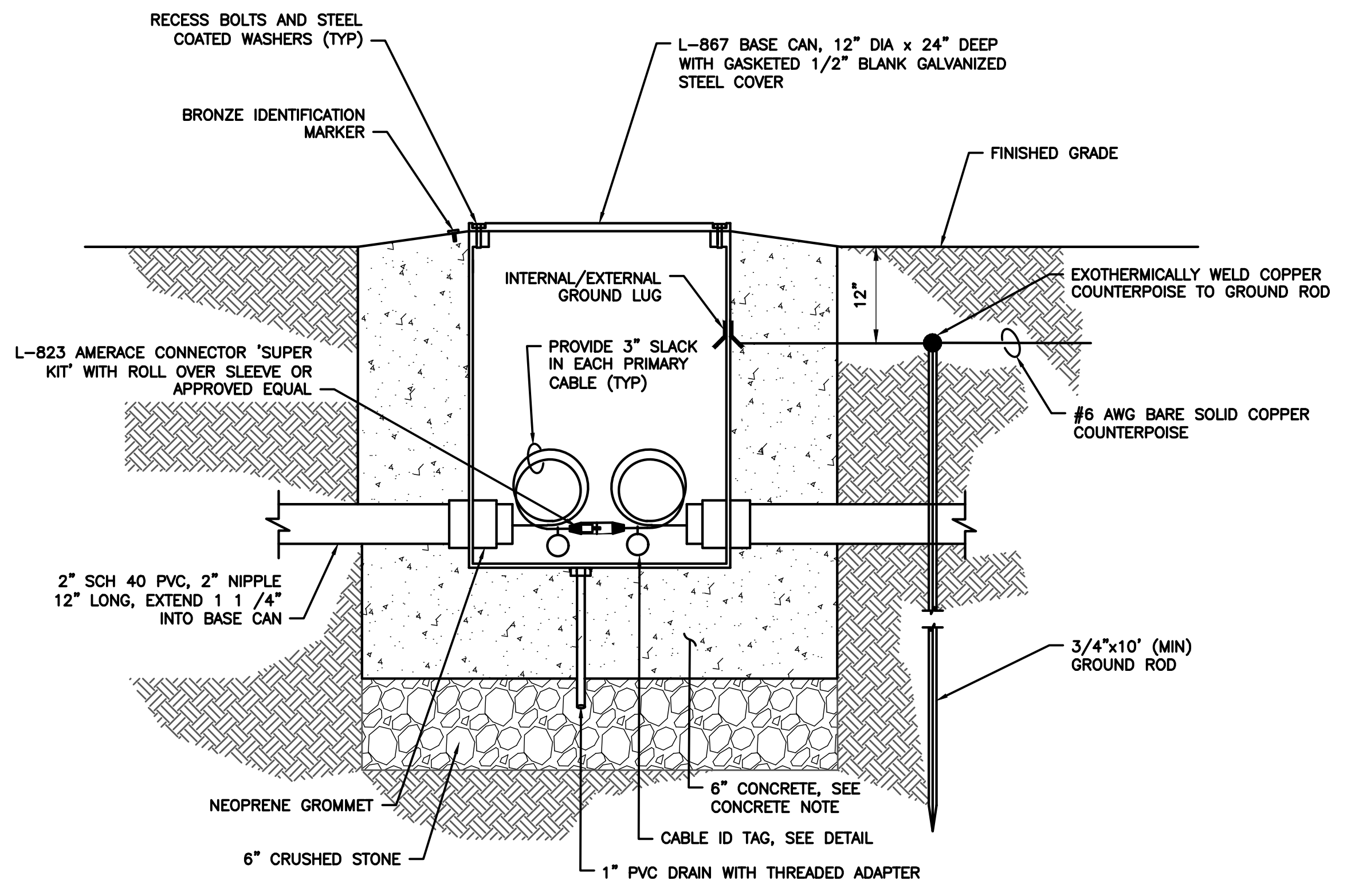
FAA NON-STANDARD TAXIWAYS PROJECT
AIRFIELD ELECTRICAL LIGHTING & SIGNAGE PLAN
— PHASE 2

PROJECT MGR:
DESIGNER: N. DERES
DRAWN BY: K. ALMOND
CHECKED BY:
SCALE: AS SHOWN
DATE: 04/11/2023

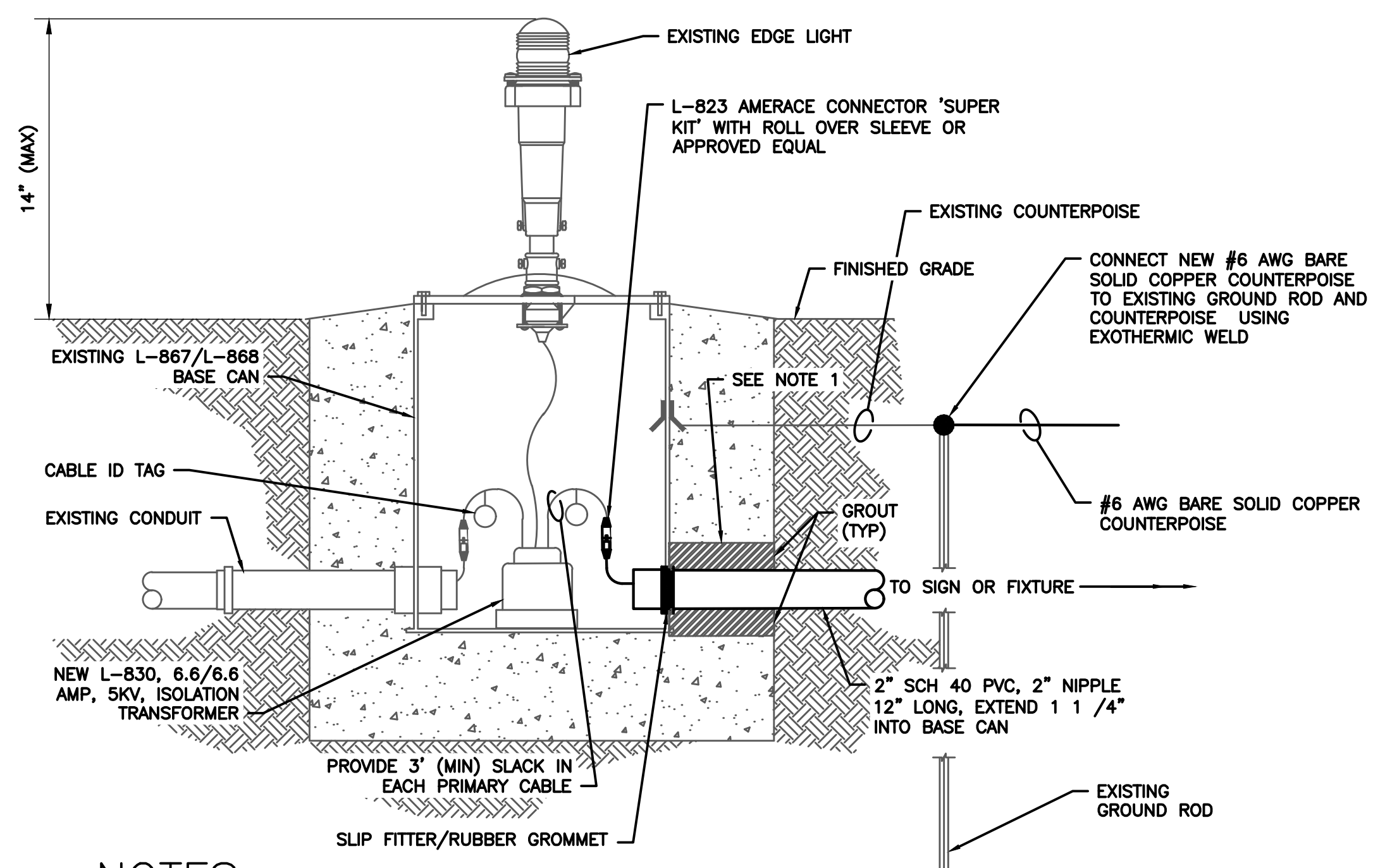


APPROVED BY: _____ DATE: _____
DIRECTOR
HOUSTON AIRPORT SYSTEM

PROJECT NO: 770
C.I.P. NO: 3-48-0110-044
H.A.S. NO: N/A
SHEET NO: EL103-P2
of

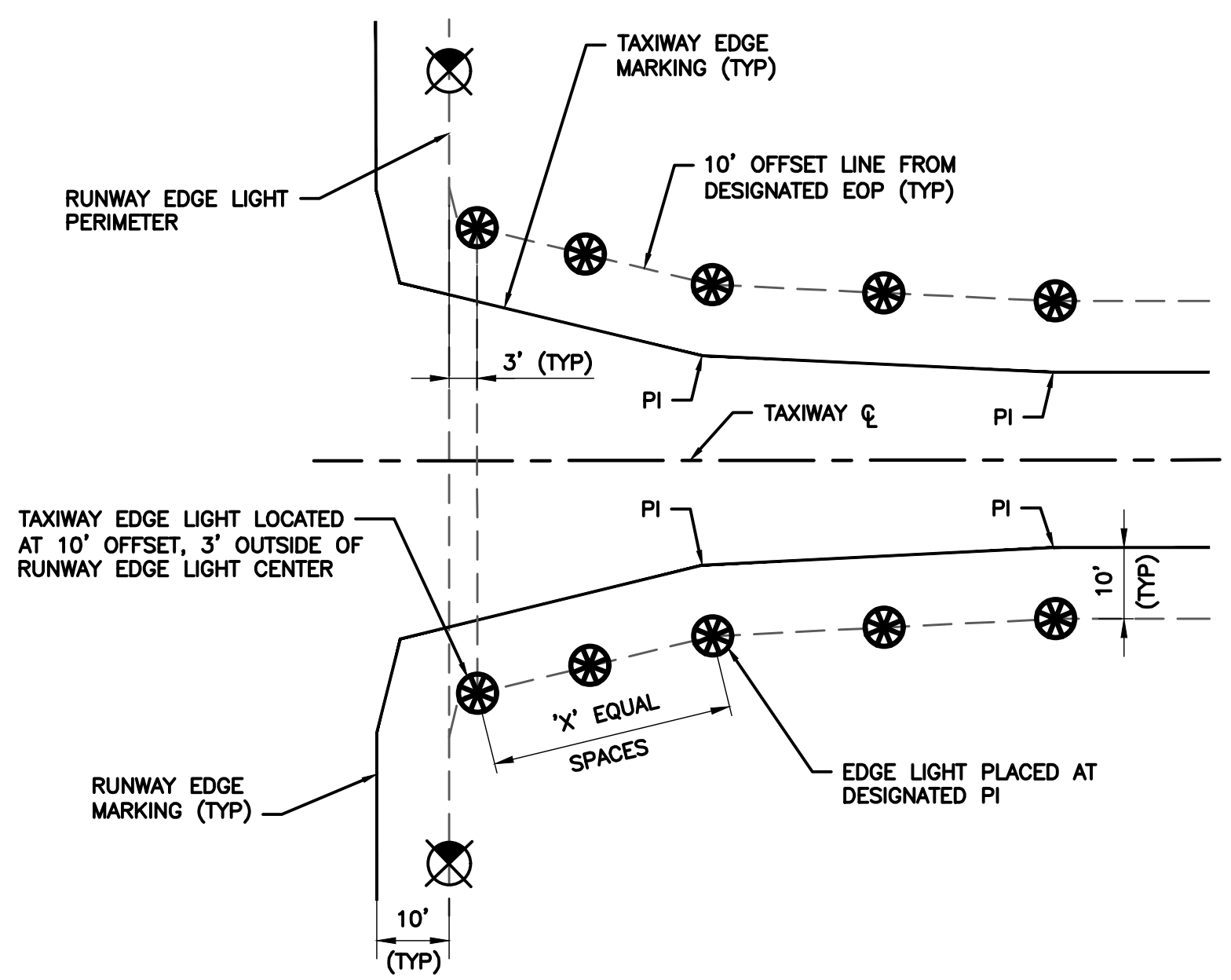


1 L-867 JUNCTION BOX DETAIL
 NTS



- NOTES:**
- USE CORE DRILL TO PENETRATE BASE CAN ANCHOR.
 - USE HOLE SAW TO CUT HOLE IN BASE CAN. REPAIR DAMAGED GALVANIZED SURFACES. PROTECT EXISTING CABLES, TRANSFORMERS, ETC FROM DAMAGE.
 - TERMINATE CONDUIT IN BASE CAN UTILIZING AN ENDBELL AND SLIP FITTER/RUBBER GROMMET.
 - FOR EDGE LIGHT LOCATED IN SHOULDER PAVEMENT, BACKFILL CONDUIT TRENCH WITH P-610.
 - PROVIDE AND INSTALL TRANSFORMER AND CONNECTOR KITS.
 - VERIFY THAT EXISTING LIGHT BASE CAN IS BONDED TO THE COUNTERPOISE SYSTEM.
 - THE CORING OF THE CONCRETE AND BASE SHALL BE INCIDENTAL TO THE INSTALLATION OF THE L-110 CONDUIT LINE ITEM.

3 EXTENDING DUCT/CONDUIT FROM EXISTING L-867 BASE CAN
 NTS



- LEGEND**
- PI = POINT OF INTERSECTION
 - PT = POINT OF TANGENCY
 - TAXIWAY EDGE LIGHT
 - RUNWAY EDGE LIGHT

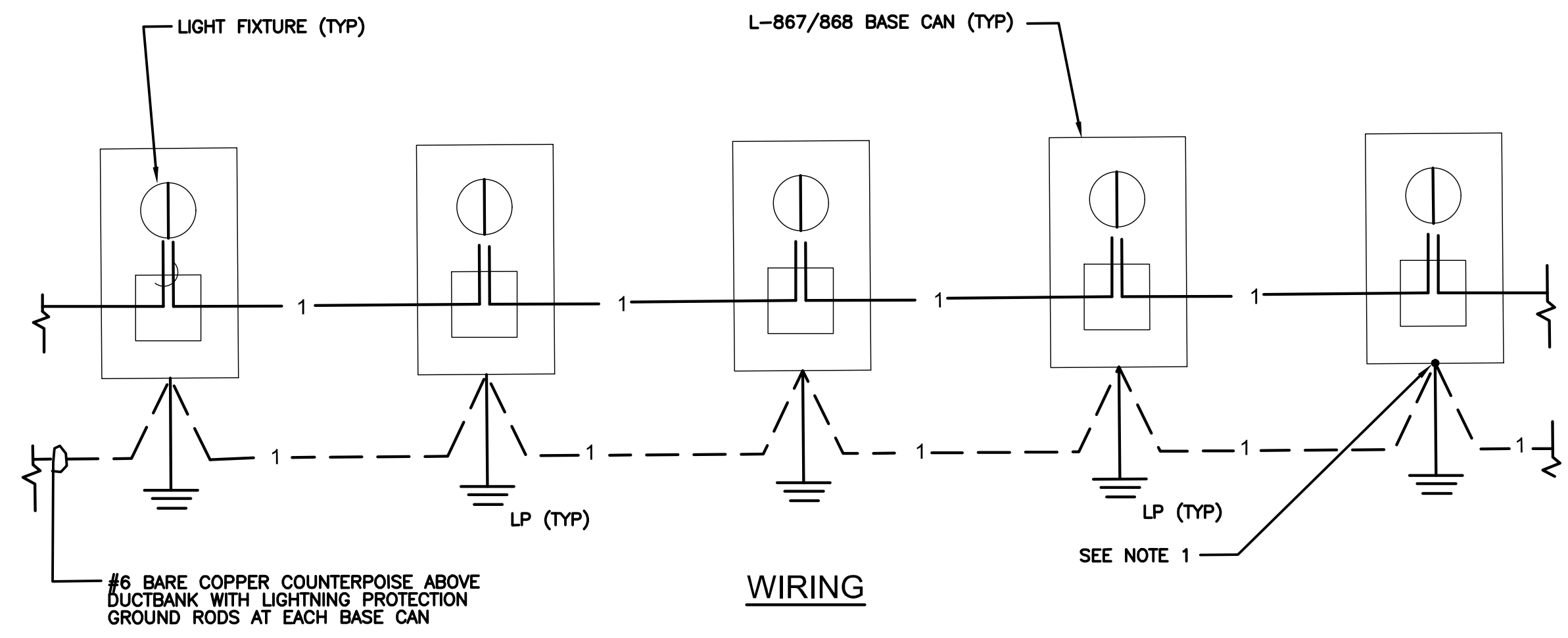
2 TYPICAL TAXIWAY EDGE LIGHTING AT RUNWAY INTERSECTION
 NTS

CONCRETE NOTE:

CONCRETE FOR BACKFILL, SIGN PADS AND BASE CANS IN THE RUNWAY/TAXIWAY SAFETY AREAS, IN EXISTING PAVEMENT OR IN AREAS OTHERWISE INDICATED IN THE DETAILS AND DRAWINGS SHALL CONFORM TO THE REQUIREMENTS OF FAA SPECIFICATION P-610. A CONCRETE MIX DESIGN SHALL BE SUBMITTED AND APPROVED BEFORE COMMENCEMENT OF WORK.

LEGEND:

- 1 #8 AWG, 5KV, PER CIRCUIT, EDGE LIGHTING CABLES, CONTINUES FOR LENGTH OF CIRCUIT (TYP)
- 1 #6 BARE COPPER COUNTERPOISE WIRE ABOVE DUCTBANK WITH LIGHTNING PROTECTION GROUND RODS AT EACH BASE CAN
- LP GROUND ROD (LP = LIGHTNING PROTECTION GROUND ROD FOR COUNTERPOISE WIRE ABOVE DUCTBANK)



NOTE:

- BOND EACH BASE CAN TO COUNTERPOISE CABLE/GUARD WIRE VIA EXTERNAL GROUND LUG. THIS APPLIES TO ALL BASE CANS,

4 LIGHTING CONDUIT/WIRING CONFIGURATION
 NTS

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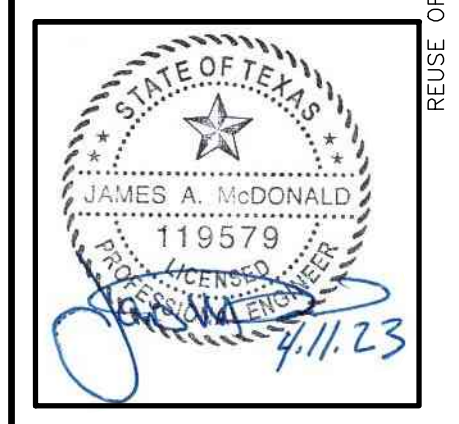
FAA NON-STANDARD TAXIWAYS PROJECT

AIRFIELD ELECTRICAL DETAILS

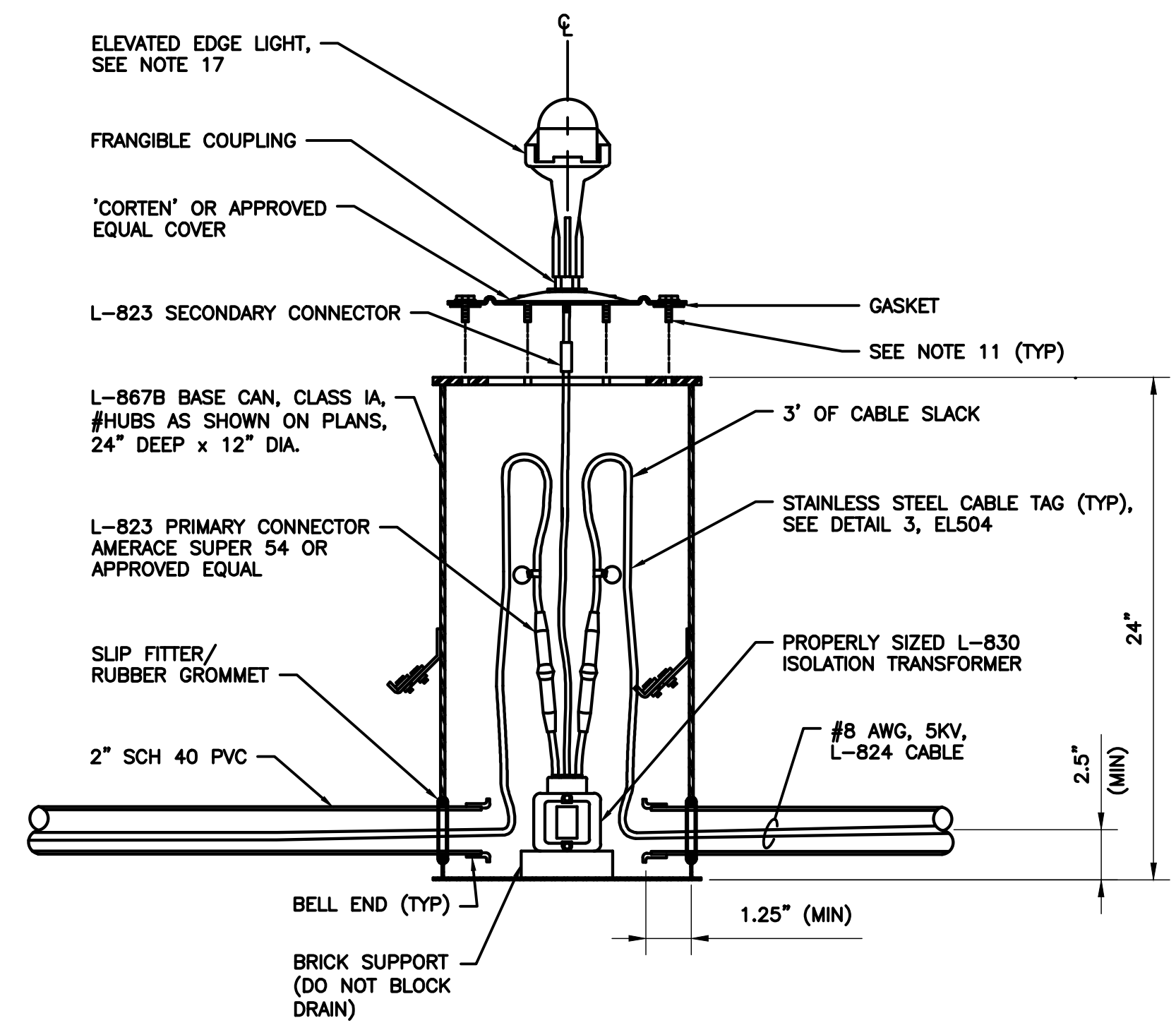
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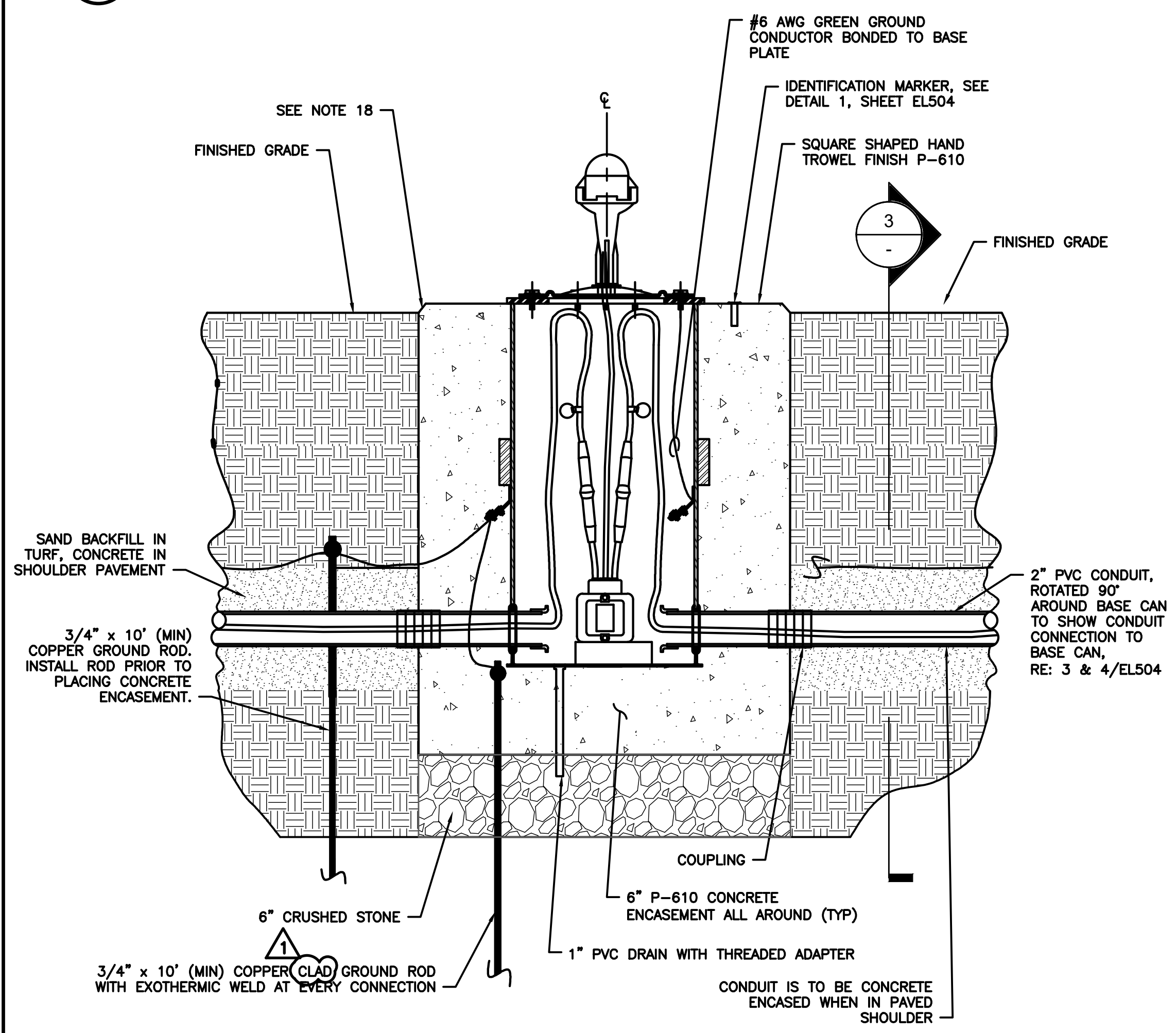
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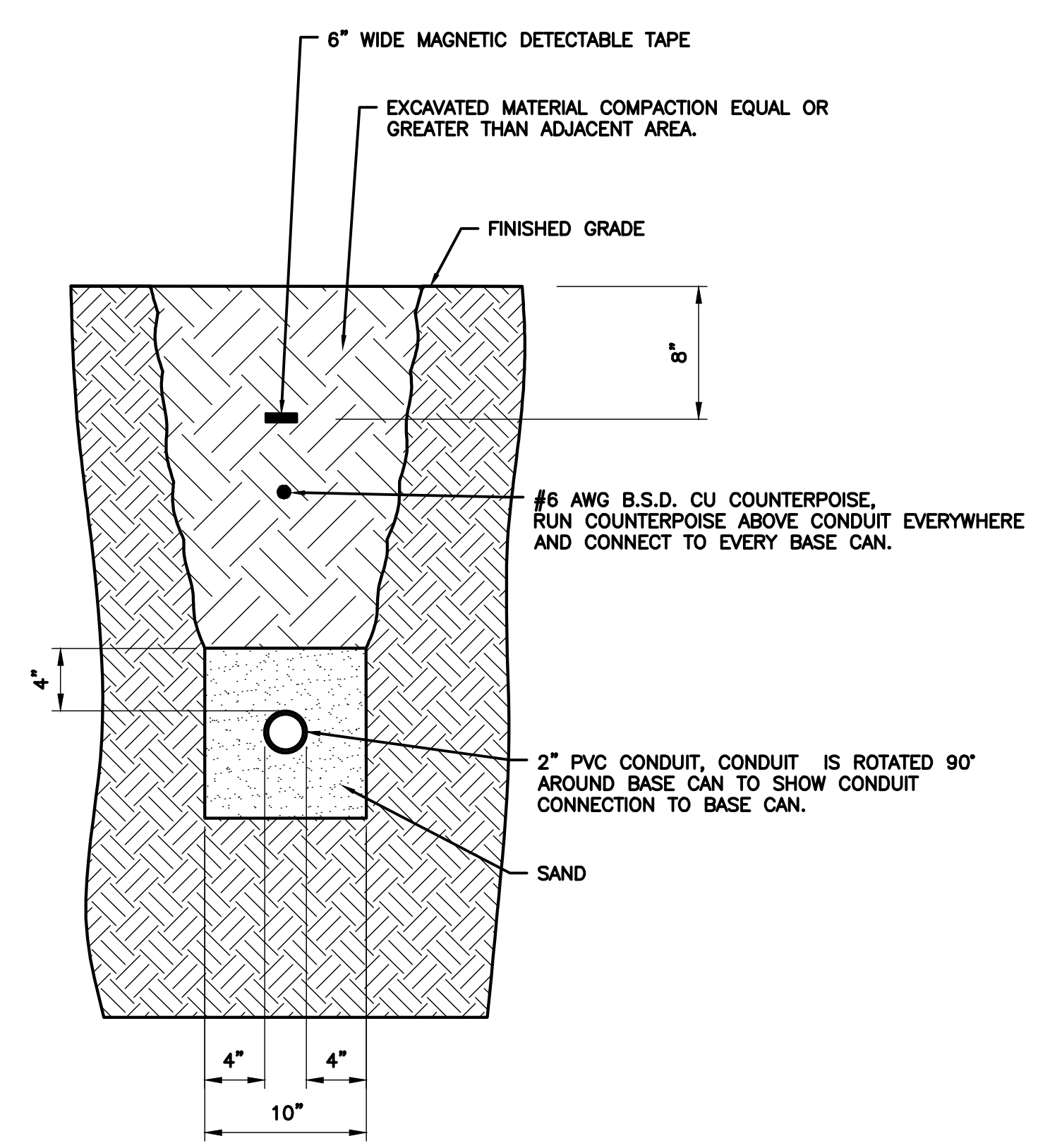
PROJECT NO: 770
 C.I.P. NO: 3-48-0110-044
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 SHEET NO: EL502
 of



1 TYPICAL ELEVATED EDGE LIGHT MATERIALS
NTS



2 ELEVATED EDGE LIGHT INSTALLED IN TURF
NTS



3 CONDUIT SECTION A
NTS

ELEVATED FIXTURE NOTES:

1. THE ELEVATED EDGE LIGHTS SHALL BE 14" HIGH UNLESS NOTED OTHERWISE IN THE CONTRACT DOCUMENTS.
2. ALL BASE CAN INSTALLATION TECHNIQUES, METHODS, MATERIALS, ETC., SHALL BE SUBMITTED TO THE RESIDENT ENGINEER FOR REVIEW AND APPROVAL PRIOR TO THE START OF WORK.
3. EACH GROUND ROD SHALL MEASURE 25 OHMS OR LESS, PRIOR TO CONNECTION TO THE GROUND SYSTEM. ADDITIONAL GROUND ROD SECTIONS SHALL BE ADDED TO OBTAIN THE 25 OHM VALUE.
4. WHENEVER MORE THAN TWO CONDUITS ENTER OR EXIT A L-867B BASE CAN, A L-867D BASE CAN SHALL BE USED. CONDUITS USED EXCLUSIVELY FOR DRAINS, THE 5' STUBOUT AND THE CONDUIT FROM THE L-867B BASE TO THE SIGN SHALL BE EXCLUDED FROM THE COUNT. THE INSTALLATION DETAIL FOR THE L-867B BASE CAN SHALL BE USED AS A GUIDE FOR THE INSTALLATION OF THE L-867D BASE CAN WITH THE APPROPRIATE DIMENSIONS INCREASED TO ACCOMMODATE THE LARGER BASE CAN.
5. EDGE LIGHTS SHALL BE INSTALLED 10.0' FROM THE THEORETICAL EDGE OF THE FULL STRENGTH PAVEMENT.
6. THE FINISHED PAVEMENT SURFACE SHALL BE PROTECTED FROM FOREIGN SUBSTANCES WHICH COULD CAUSE STAINING, IE. CONCRETE, OIL, ETC. THE CONTRACTOR SHALL IMMEDIATELY CLEAN ALL SPILLS AND CORRECT/CLEAN ANY STAINED SURFACES AT THE CONTRACTOR'S EXPENSE.
7. THE P-606 SEALER SHALL FILL THE VOID TO WITHIN 0.125" OF THE TOP EDGE OF THE CONCRETE RING AT THE LOWEST POINT OF THE CONCRETE RING. ANY OVER POURS SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
8. ALL AIRFIELD LIGHTING MATERIALS SHALL COMPLY WITH FAA SPECIFICATIONS AND REQUIREMENTS.
9. IMMEDIATELY AFTER THE HOLES ARE CORED, THE BASE CANS SHALL BE INSTALLED AND THE P-610 PLACED SO AS TO PREVENT WATER FROM ENTERING THE STABILIZED SUBGRADE.
10. BEFORE PAVING MAY PROCEED THE CONTRACTOR SHALL DEMONSTRATE TO THE RESIDENT ENGINEER THAT THE BASE CANS ARE AT THE CORRECT ELEVATION AND THAT THE PROPER CLEARANCE EXISTS BETWEEN THE BASE CAN AND THE PAVING TRAIN.
11. THE FIXTURE MOUNTING BOLTS SHALL EXTEND THRU THE BASE CAN MOUNTING FLANGE INTO THE BASE CAN A MIN. OF 0.5". THE BOLTS SHALL HAVE ENOUGH THREAD LENGTH SO THEY DO NOT SHOULDER OUT BEFORE THE FIXTURE IS SECURELY TIGHTENED. ANTI-SEIZE SHALL BE USED ON BOLTS (NOALOX OR APPROVED EQUAL). CONTRACTOR SHALL PROVIDE STAINLESS STEEL HARDWARE AND TWO-PIECE LOCK WASHERS FOR ELEVATED AND IN-PAVEMENT FIXTURES.
12. ALL HUBS SHALL BE FACTORY DRILLED PRIOR TO GALVANIZING.
13. TYPICAL SECTIONS FOR PAVEMENT AND THICKNESSES SHALL BE PER CIVIL PLANS.
14. P-610 CONCRETE AROUND BASE CANS AND DUCT/CONDUIT SHALL BE COMPLETELY CONSOLIDATED BY MECHANICAL MEANS AND SHALL BE FREE OF ANY VOIDS.
15. ALL L-824 CABLES SHALL BE IDENTIFIED WITH AN 18 GAUGE STAINLESS STEEL TAG WITH ITS RESPECTIVE CIRCUIT/LOOP NUMBER AT ALL ACCESSIBLE LOCATIONS. ATTACH ID TAG 12" FROM THE L-823 CONNECTORS OR MID LOOP, IF NO CONNECTORS ARE REQUIRED. THE CONDUCTORS SHALL BE IDENTIFIED ON EACH SIDE OF THE CONNECTORS OR LOOP.
16. L-823 CONNECTORS SHALL BE INSTALLED ON ALL CABLES, IN EACH MANHOLE, BASE CAN, OR OTHER ACCESSIBLE LOCATIONS.
17. FOR BLANK CANS IN TURF, DELETE LIGHT FIXTURE AND INSTALL 3/8" STEEL COVER.
18. FOR BLANK CANS INSTALLED IN TURF, PROVIDE A 1" CHAMFER ON THE EDGE OF THE CONCRETE COLLAR WITH THE CONCRETE COLLAR PROTRUDING 1" ABOVE FINISHED GRADE.
19. WHEN ADJUSTING THE ELEVATION OF AN EXISTING BASE CAN IN TURF, CONTRACTOR SHALL DOWEL THE TOP OF THE EXISTING CONCRETE COLLAR WITH #5 REBAR (5 EQUALLY SPACED) AND EPOXY THE REBAR TO THE CONCRETE COLLAR TO EXTEND 10" MINIMUM INTO THE CONCRETE COLLAR. THE CONTRACTOR SHALL ORDER A BASE CAN SPACER RING AND/OR BASE CAN EXTENSION TO THE HEIGHT REQUIRED TO INSTALL AND POUR A CONCRETE COLLAR EXTENSION TO THE PROPOSED NEW FINISHED GRADE (SEE NOTE 18). THE NEW CONCRETE COLLAR AROUND THE NEW SPACER RING AND/OR EXTENSION RING SHALL BE THE SAME DIMENSIONS AS THE EXISTING COLLAR. CONTRACTOR SHALL PROVIDE A MINIMUM OF 1" COVER FROM THE TOP OF THE VERTICAL REBAR TO THE TOP OF THE NEW CONCRETE COLLAR EXTENSION.

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VERIFY SCALE
BAR IS ONE INCH ON
ORIGINAL DRAWING. 1"

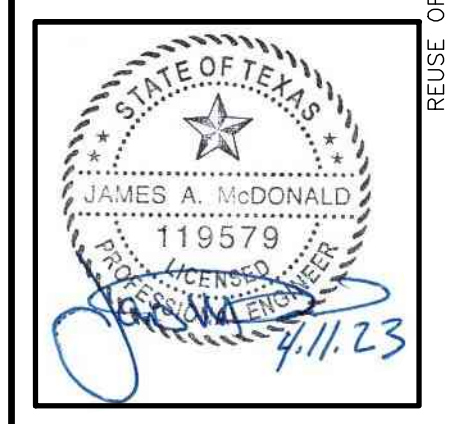
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1	ADDENDUM 2	04/11/2023	ND

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AIRFIELD ELECTRICAL DETAILS

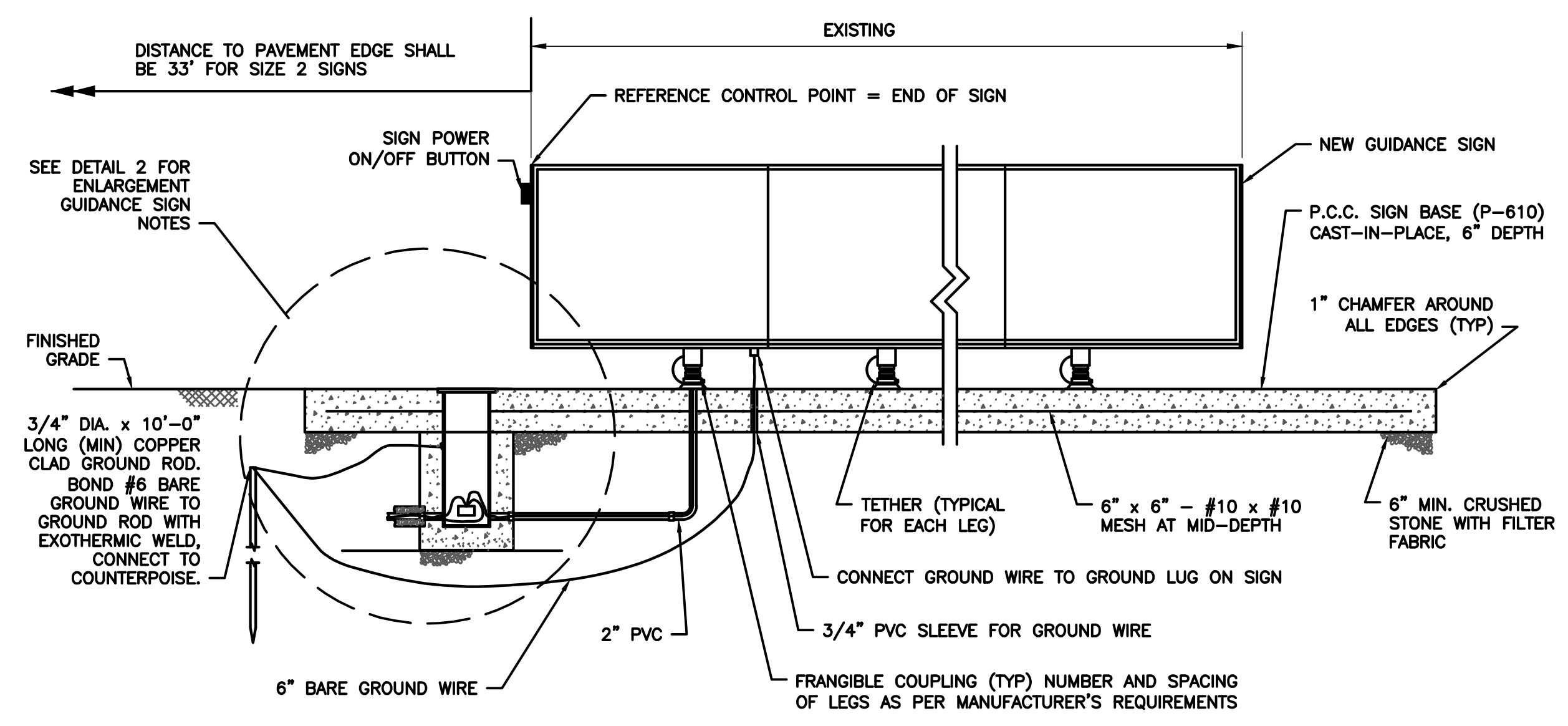
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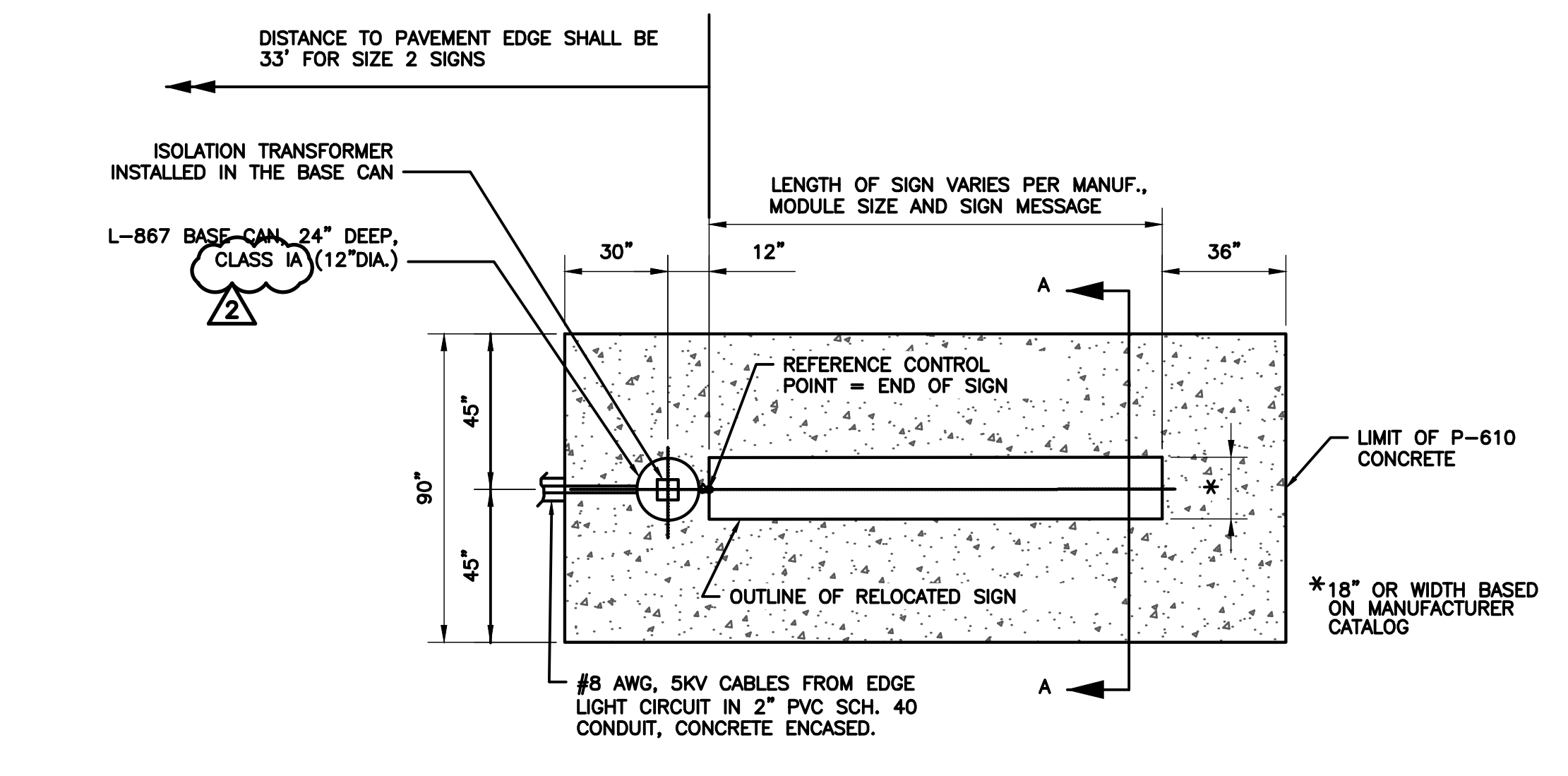
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C.I.P. NO: 3-48-0110-044
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SHEET NO: EL503
of

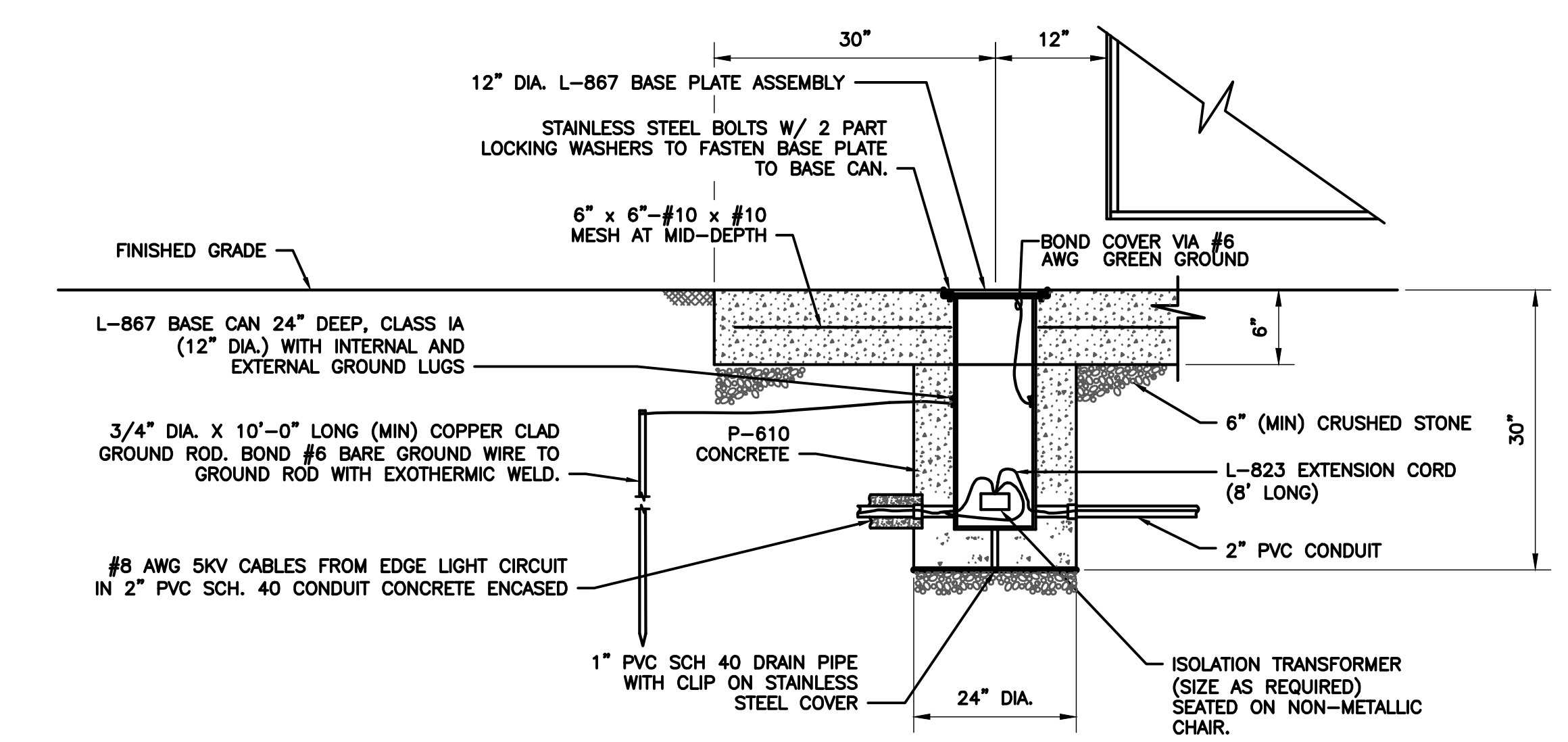
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1 AIRFIELD GUIDANCE SIGN BASE PLAN-FRONT VIEW (UP TO 4 MODULES) NTS



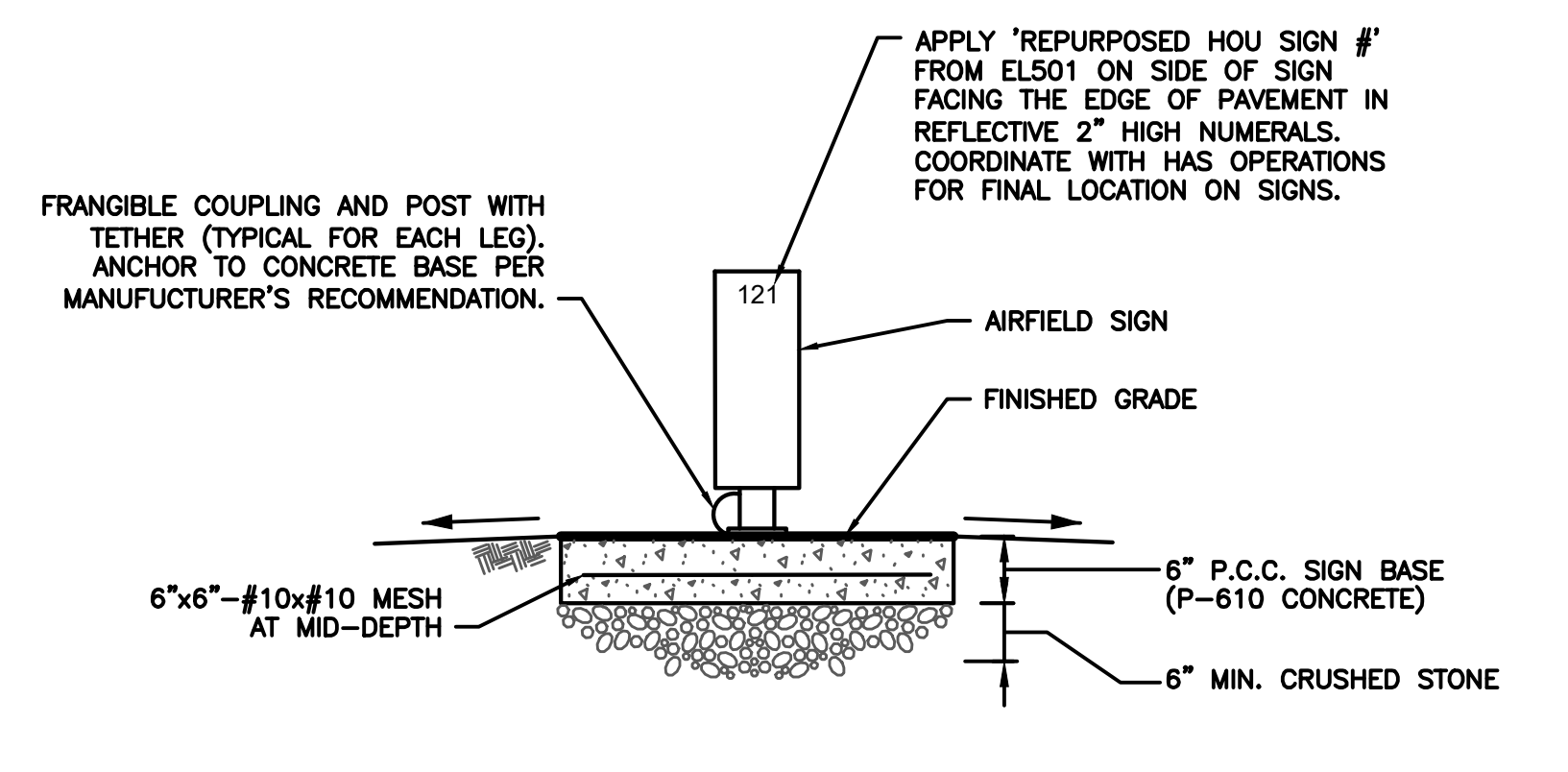
3 AIRFIELD GUIDANCE SIGN BASE-TOP VIEW NTS



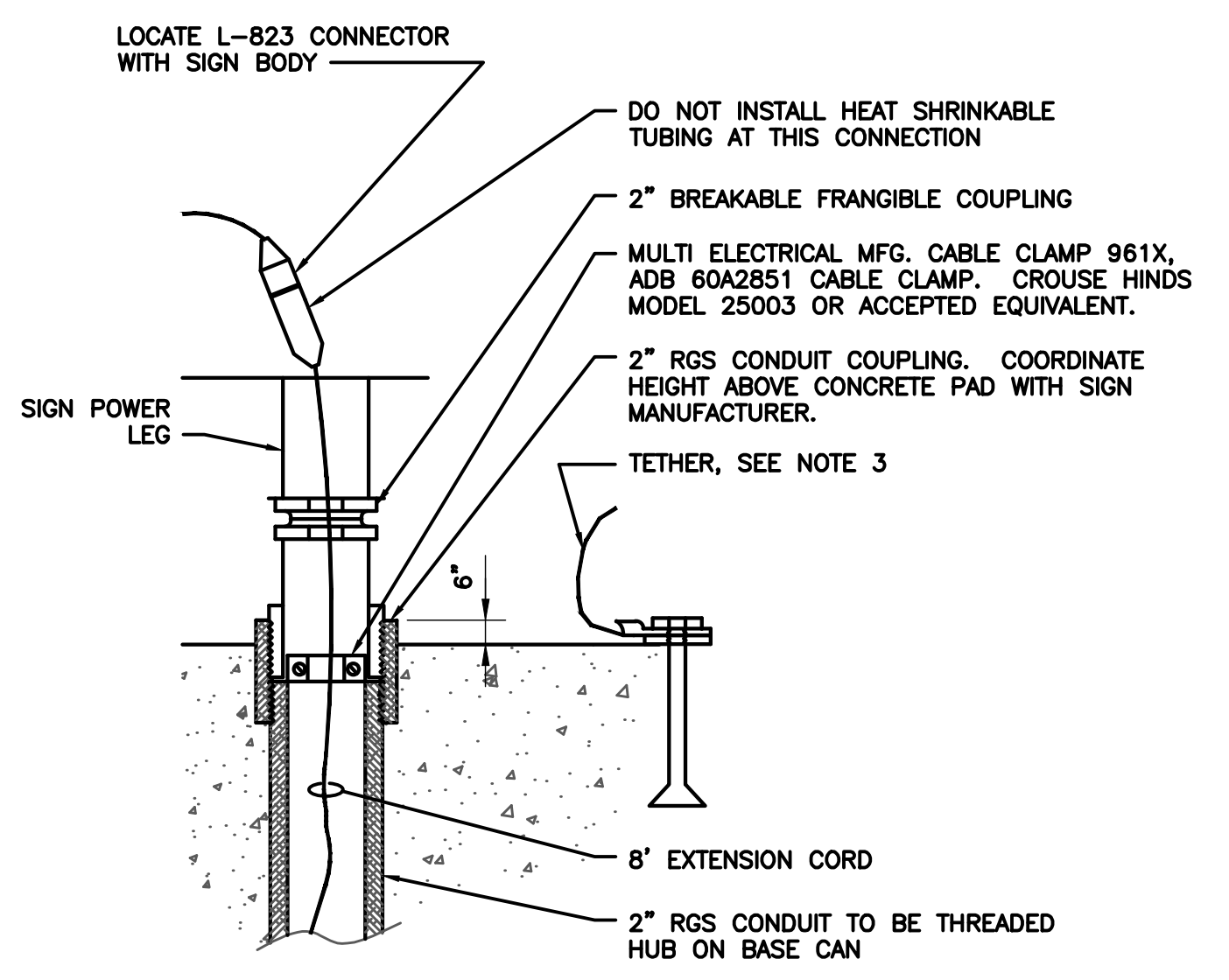
2 AIRFIELD GUIDANCE SIGN BASE PLAN - DETAIL A NTS

GUIDANCE SIGN NOTES

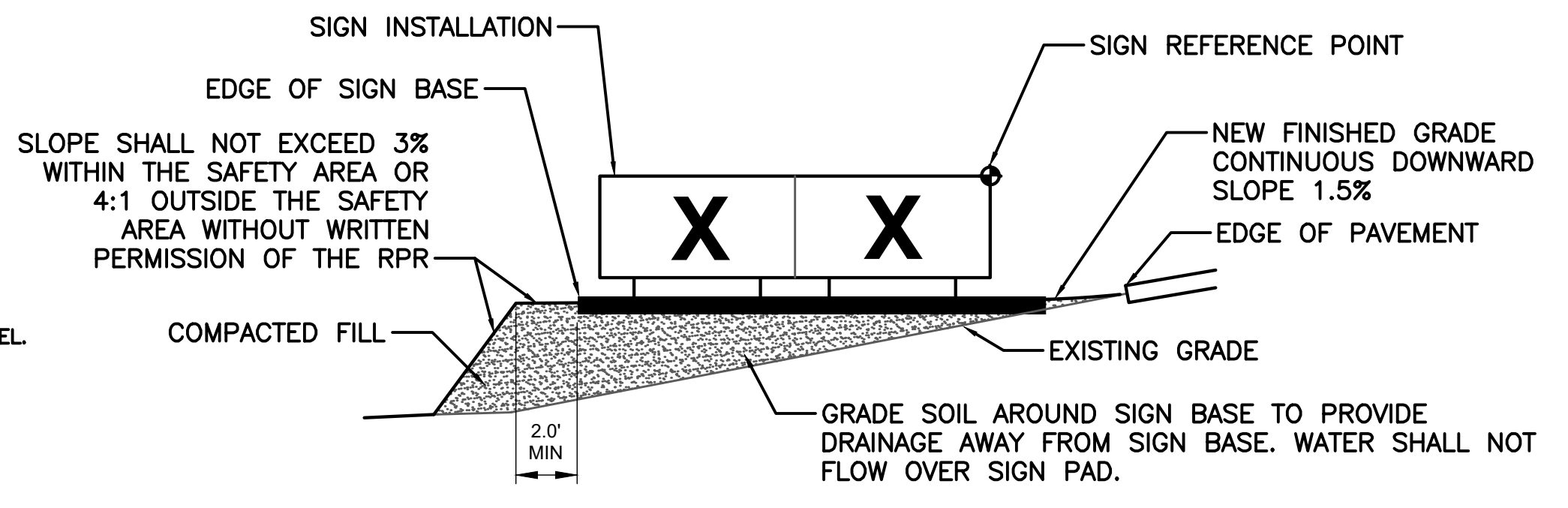
1. FINISHED GRADE AROUND FOUNDATION SHALL SLOPE TO DRAIN AWAY FROM SIGN.
2. PCC SIGN BASE SHALL HAVE A 28 DAY STRENGTH OF 4000 PSI.
3. CRUSHED AGGREGATE BASE COURSE SHALL BE COMPACTED TO 90% MAXIMUM DENSITY PER ASTM D 1557.
4. SIGNS SHALL BE ANCHORED TO CONCRETE BASE WITH BOLTS, NUTS, WASHERS AND CONCRETE ANCHORS. ALL MATERIAL SHALL BE MADE OF STAINLESS STEEL.
5. COORDINATE INSTALLATION WORK WITH THE SIGNS MANUFACTURER AND COMPLY WITH THEIR REQUIREMENTS AND RECOMMENDATIONS.
6. ALL SIGN LAMPS MUST BE CAPABLE OF BEING SERVICED WITHOUT THE USE OF TOOLS.
7. SOME SIGN MANUFACTURERS REQUIRE SEPARATE GROUNDING FOR THE SIGN ITSELF. REFER TO THE MANUFACTURER'S CATALOG.
8. POWER TO THE SIGN MUST BE PROVIDED THROUGH BREAKAWAY CABLE CONNECTORS INSTALLED AT THE L-867 SIGN JUNCTION CAN.
9. THERE MUST BE NO ABOVE GROUND ELECTRICAL CONNECTION BETWEEN SIGNS IN A SIGN ARRAY.
10. RUNWAY HOLD POSITION SIGNS MUST BE INSTALLED NO CLOSER TO THE RUNWAY THAN IN-LINE WITH THE OUTBOARD LINE OF THE HOLD POSITION MARKING, AND NO FURTHER THAN 10' FROM THAT MARKING.



4 AIRFIELD GUIDANCE SIGN-SECTION A-A NTS



6 SIGN POWER LEG NTS



5 GRADING AND FILL DETAIL NTS

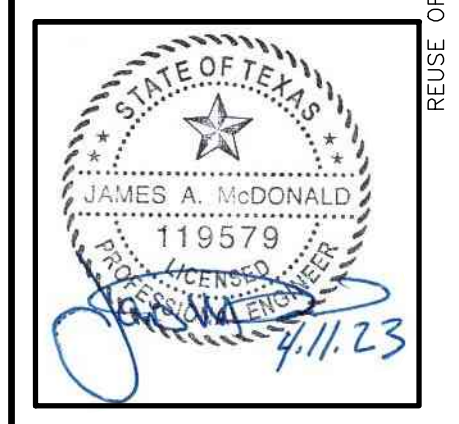
NOTE:
EXCAVATION, GRADING, SITE PREPARATION, FILL, SOD, ETC. FOR SIGNS IS INCIDENTAL TO THE SIGN PAY ITEM.

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1	ADDENDUM 2	04/11/2023	ND

FAA NON-STANDARD TAXIWAYS PROJECT
 AIRFIELD ELECTRICAL DETAILS

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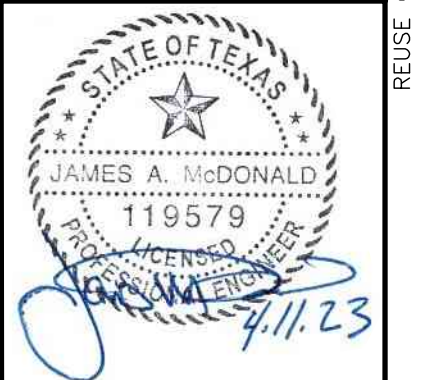
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H.A.S. NO:	N/A
SHEET NO:	EL505

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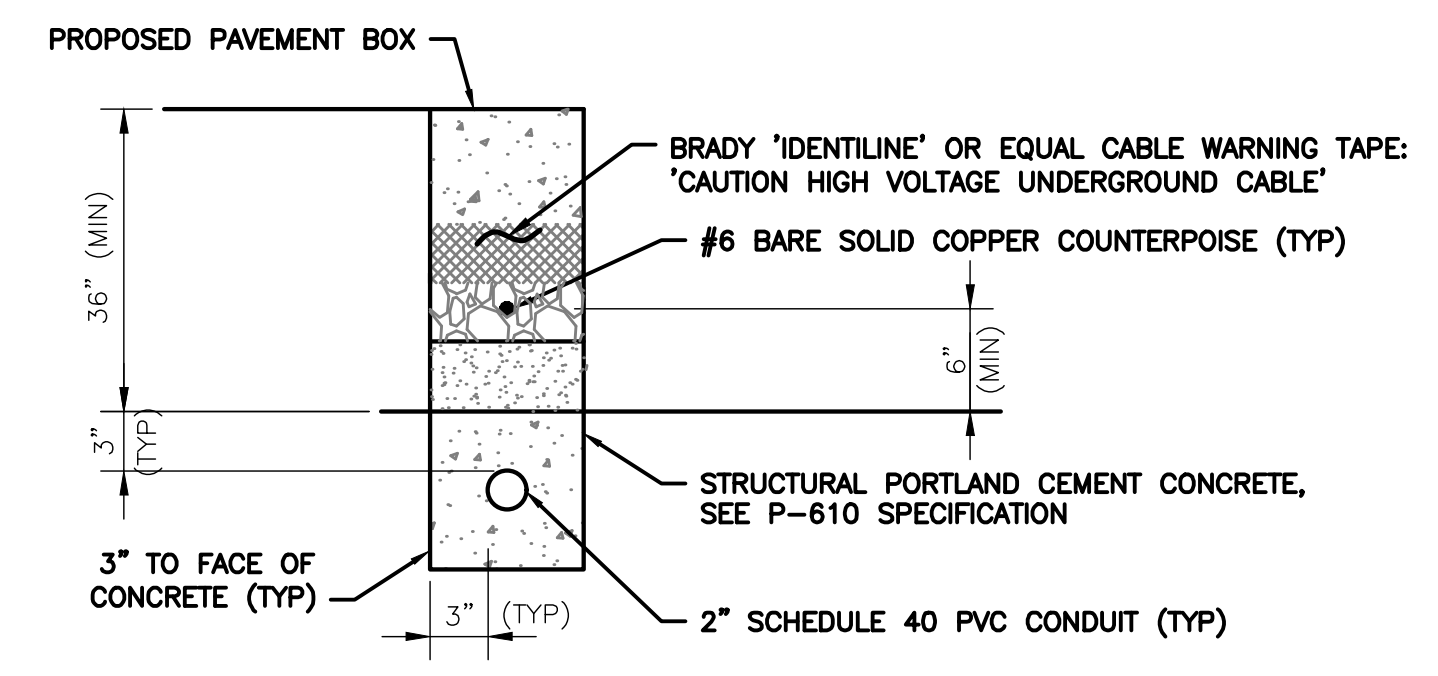
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 AIRFIELD ELECTRICAL DETAILS

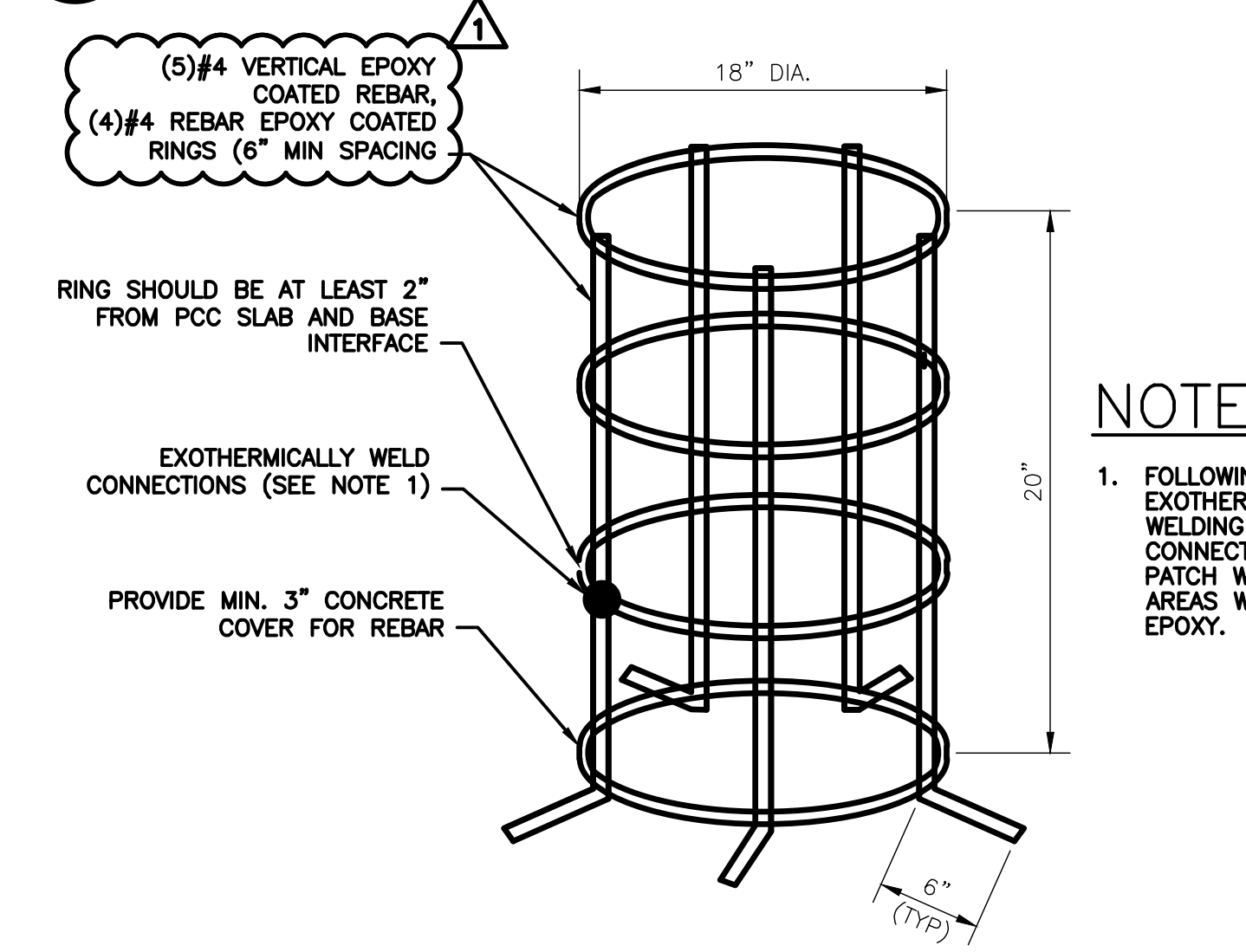
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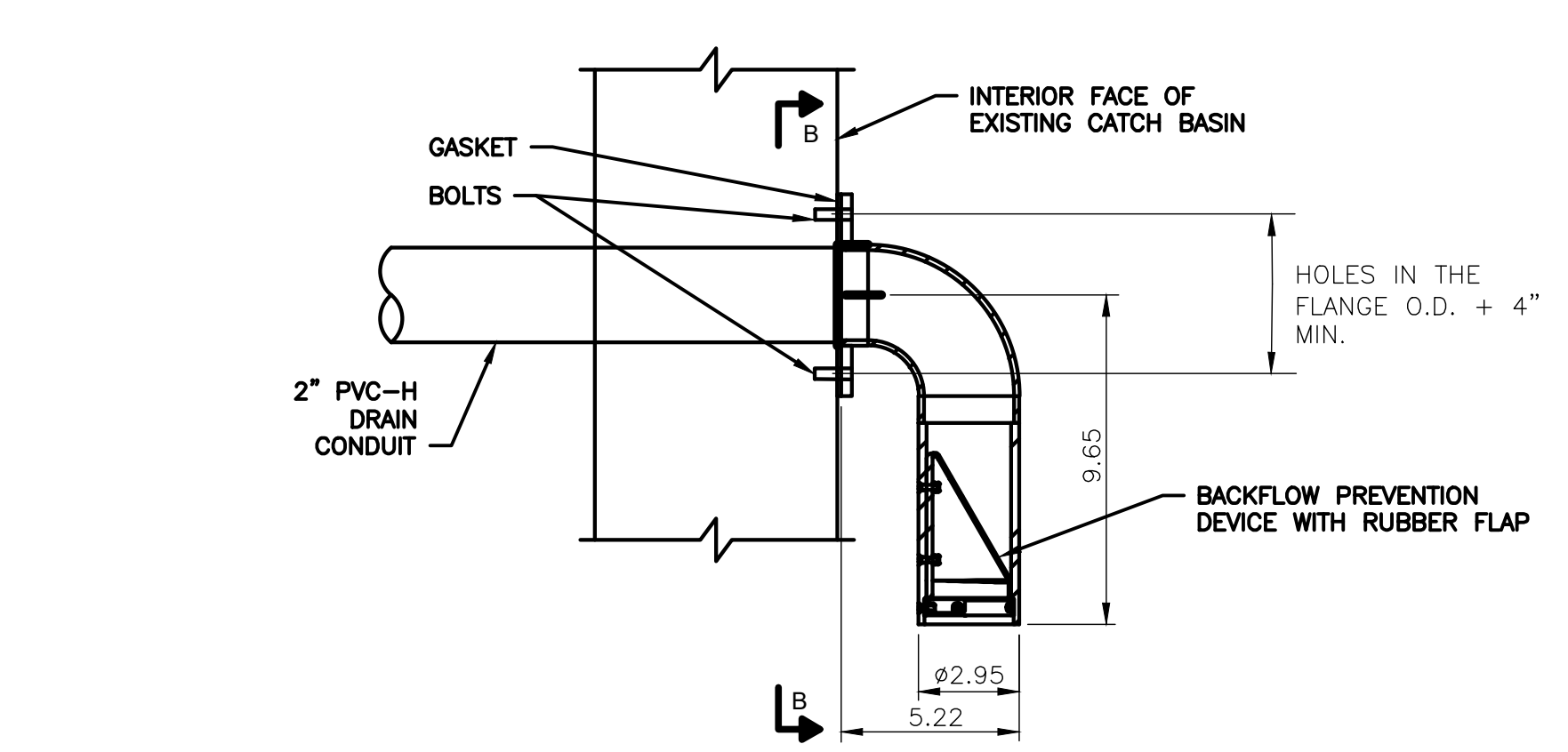
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 H.A.S. NO: N/A
 SHEET NO: EL510



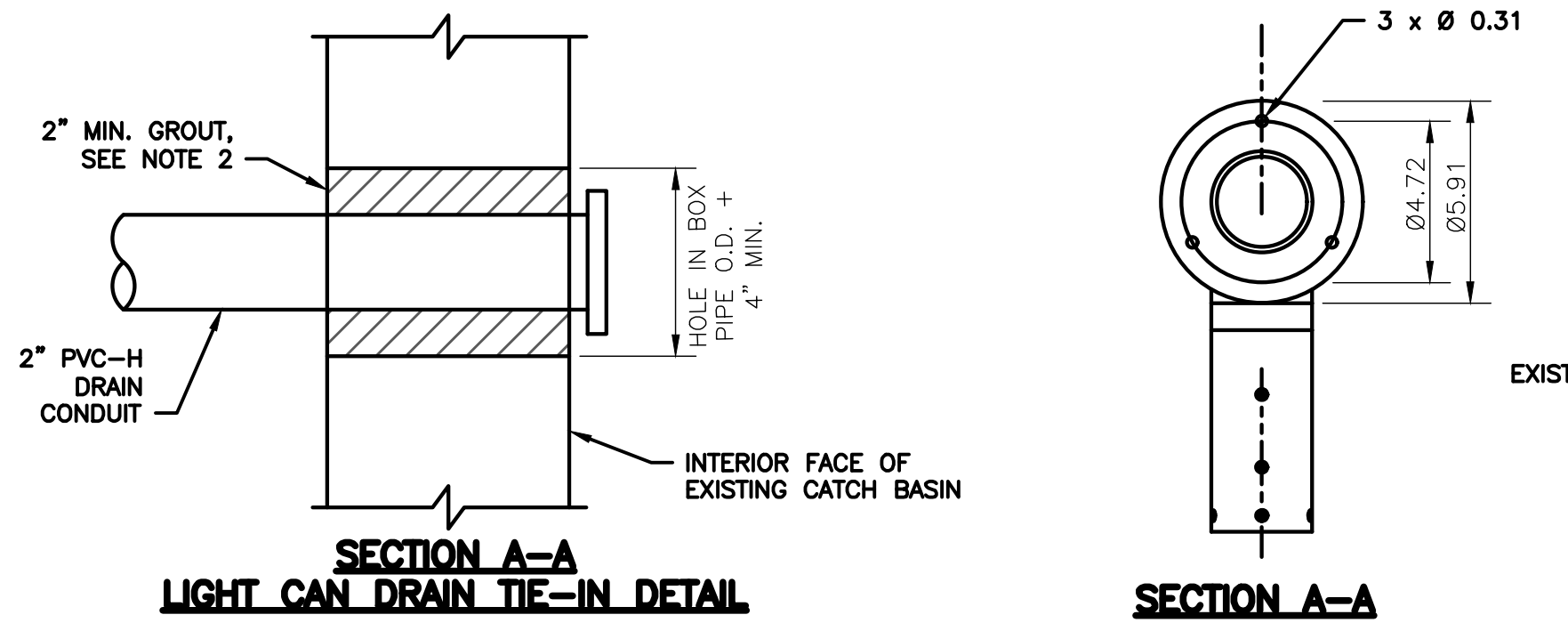
1-WAY 2 INCH CONCRETE ENCASED DUCT UNDER PAVEMENT
 NTS



TYPICAL LIGHT BASE REBAR CAGE DETAIL
 NTS

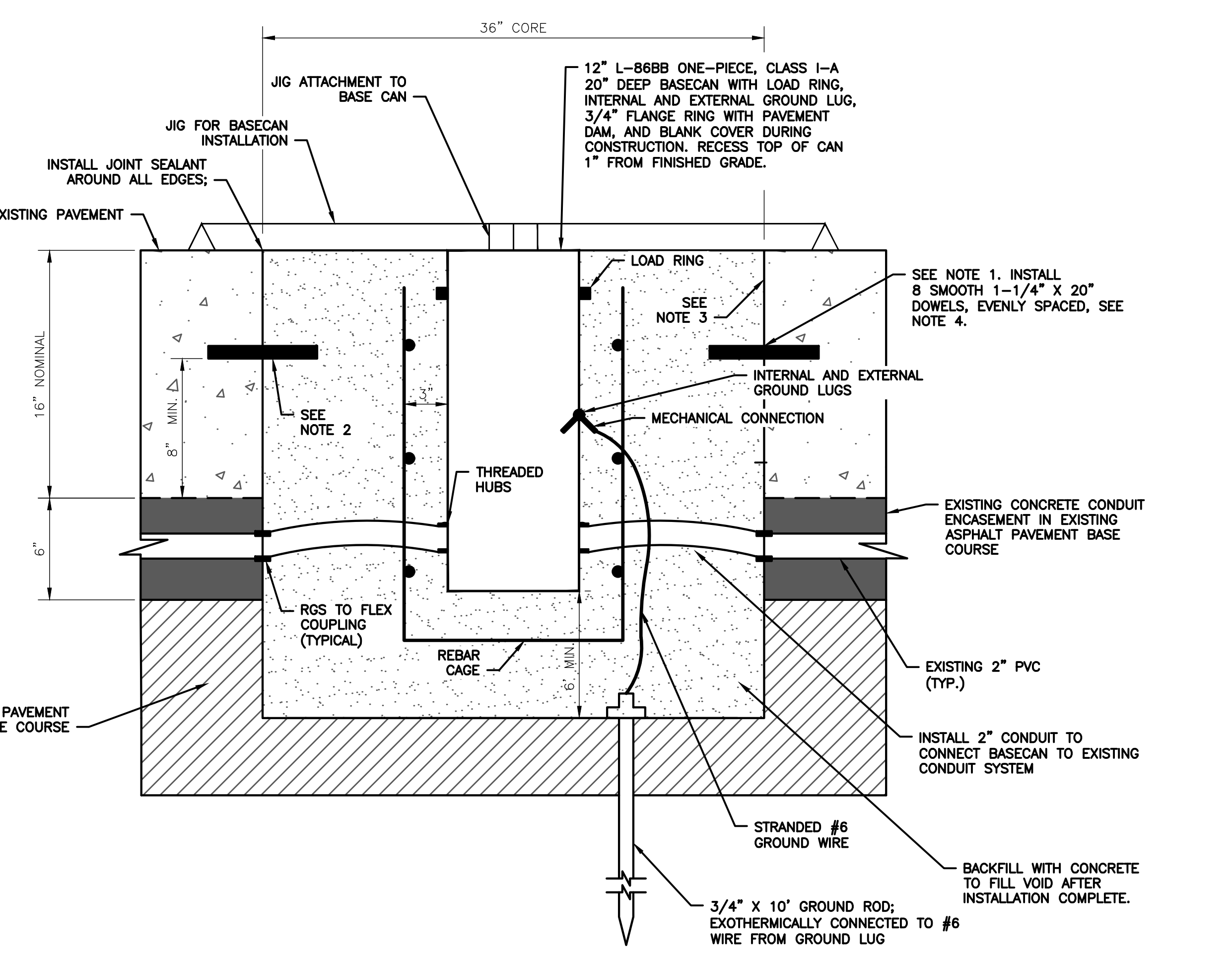


INSTALLATION OF WATER BACKFLOW PREVENTION DEVICE IN THE CATCH BASIN



- NOTES:**
- FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES, SEE ELECTRICAL LEGEND SHEET.
 - GROUT, IF NEEDED, SHALL BE NON-SHRINK, NON-METALLIC GROUT IN CONFORMANCE WITH ASTM C1107.
 - FURNISH AND INSTALL BACKFLOW PREVENTION DEVICE AT DRAINAGE CONDUIT ENTRANCE. MATCH DRAINAGE CONDUIT DIAMETER SIZE.
 - CONTRACTOR SHALL WIRE BRUSH THE WALLS AND REMOVE ALL WATER AND ANY DEBRIS/SAND FROM ALL DRAINAGE CATCH BASINS WHICH HAVE AN ELECTRICAL CONDUIT DRAIN ENTERING INTO IT.

STORMWATER BACKFLOW PREVENTION DEVICE INSTALLATION
 NTS

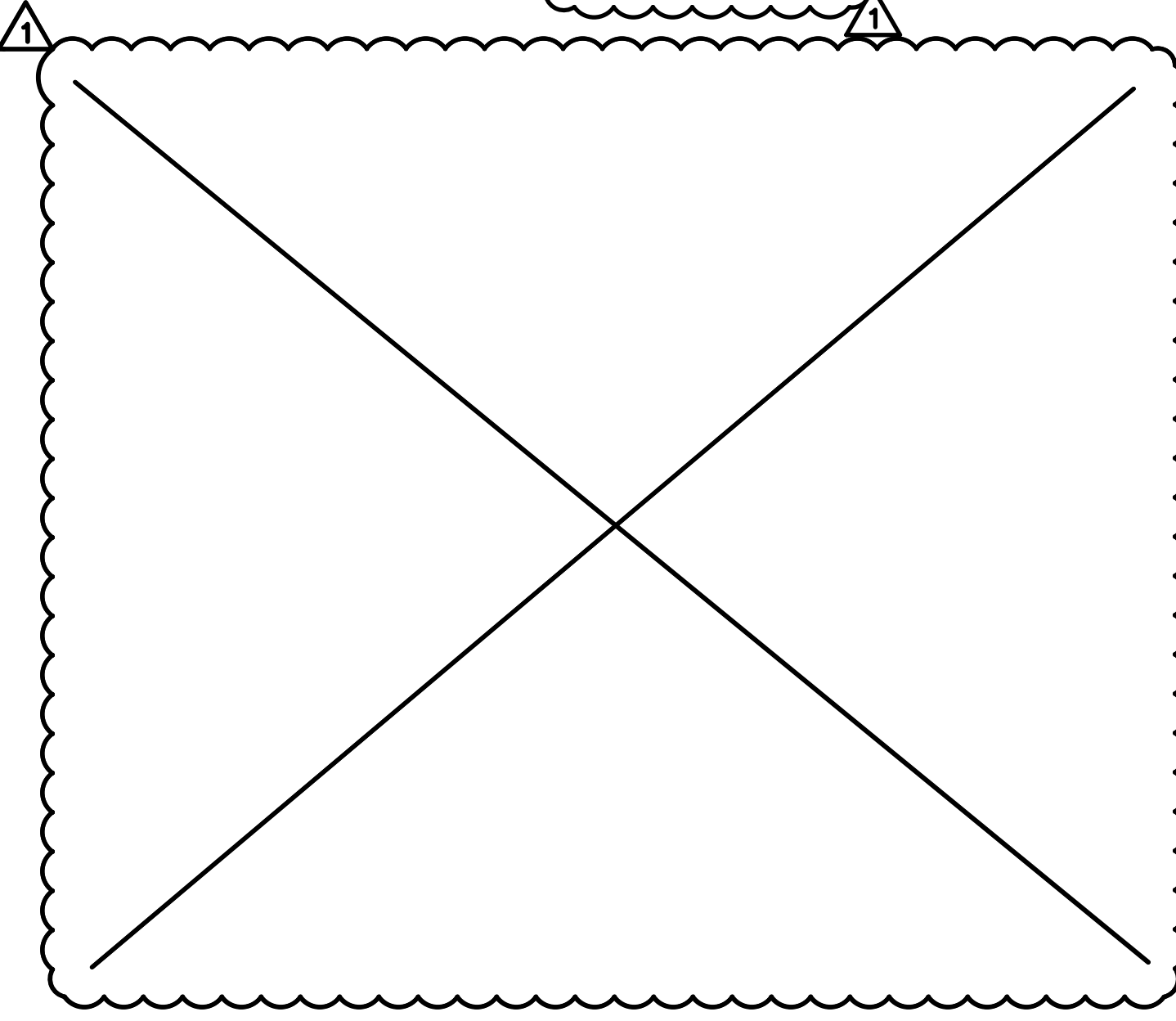


- NOTES:**
- INSTALL 8 EVENLY SPACED, SMOOTH 1 1/4" X 20" DOWELS. PAINT AND OIL EXPOSED HALF OF DOWEL ONLY.
 - EPOXY DOWEL INTO DRILLED SOCKET IN PAVEMENT SLAB.
 - COAT HORIZONTAL AND VERTICAL FACES WITH DOUBLE APPLICATION OF MEMBRANE FORMING CURING COMPOUND PRIOR TO PLACING NEW PCC, PROTECT DOWEL BARS FROM CURE MATERIAL.
 - ADJUST DOWEL INSTALLATION TO PROVIDE CLEARANCE FROM BASE CAN. MAY BE INSTALLED WITH 12" EMBEDDED IF NEEDED FOR CLEARANCE.

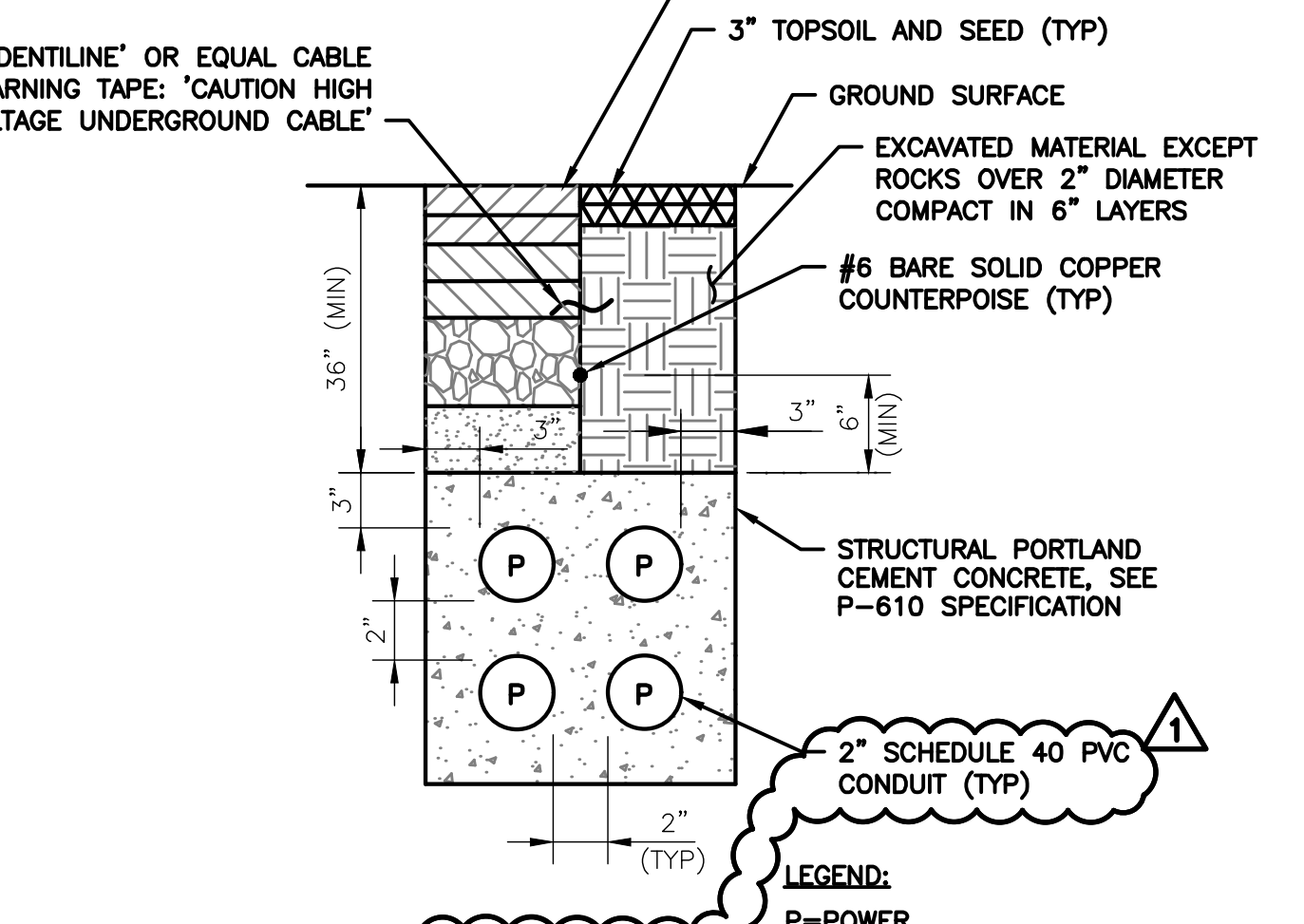
INSTALLATION OF NEW BASE CAN IN EXISTING PAVEMENT BY 36" CORE
 NTS

GENERAL NOTES & ASSUMPTIONS—CONCRETE ENCASED DUCTBANK:

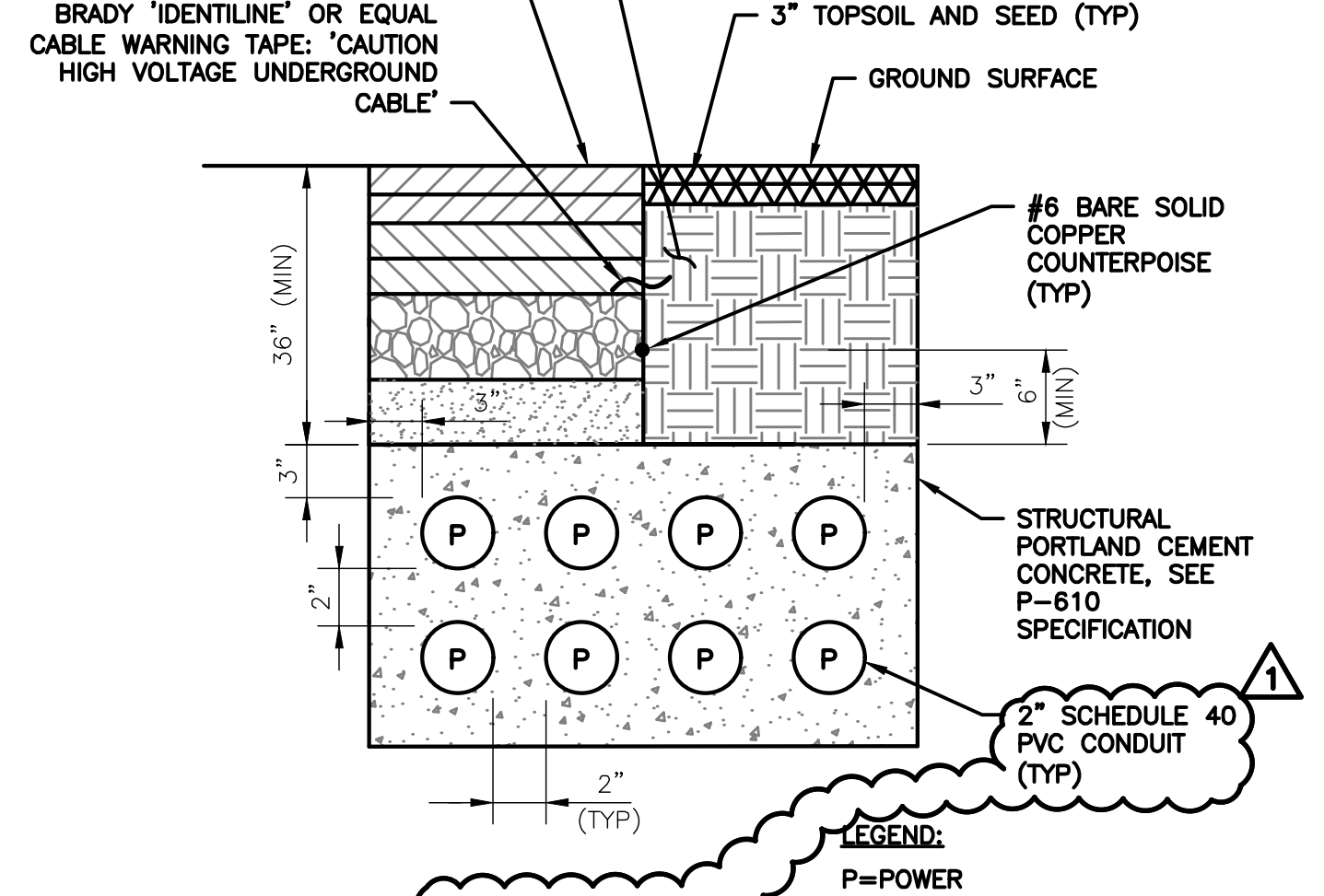
- CONTRACTOR TO REFER TO PLAN AND PROFILE SHEETS FOR INFORMATION ON POSSIBLE UTILITY CONFLICTS WITHIN THE IMMEDIATE VICINITY OF THE PROPOSED DUCTBANKS.
- CONTRACTOR MUST PROVIDE COUNTERPOISE AND WARNING TAPE OVER CENTERLINE OF DUCTBANK AS SHOWN FOR EVERY LINEAR FOOT OF DUCTBANK. CONTRACTOR MUST PROVIDE PULL CORD IN ALL EMPTY CONDUITS OF DUCTBANKS IN ACCORDANCE WITH SECTION L-110.
- ALL DUCTBANKS CONSTRUCTED UNDER FULL STRENGTH PAVEMENT SHALL BE REINFORCED. SEE GENERAL NOTE, DETAIL 8.



4-WAY 2-INCH CONCRETE ENCASED DUCTBANK
 NTS



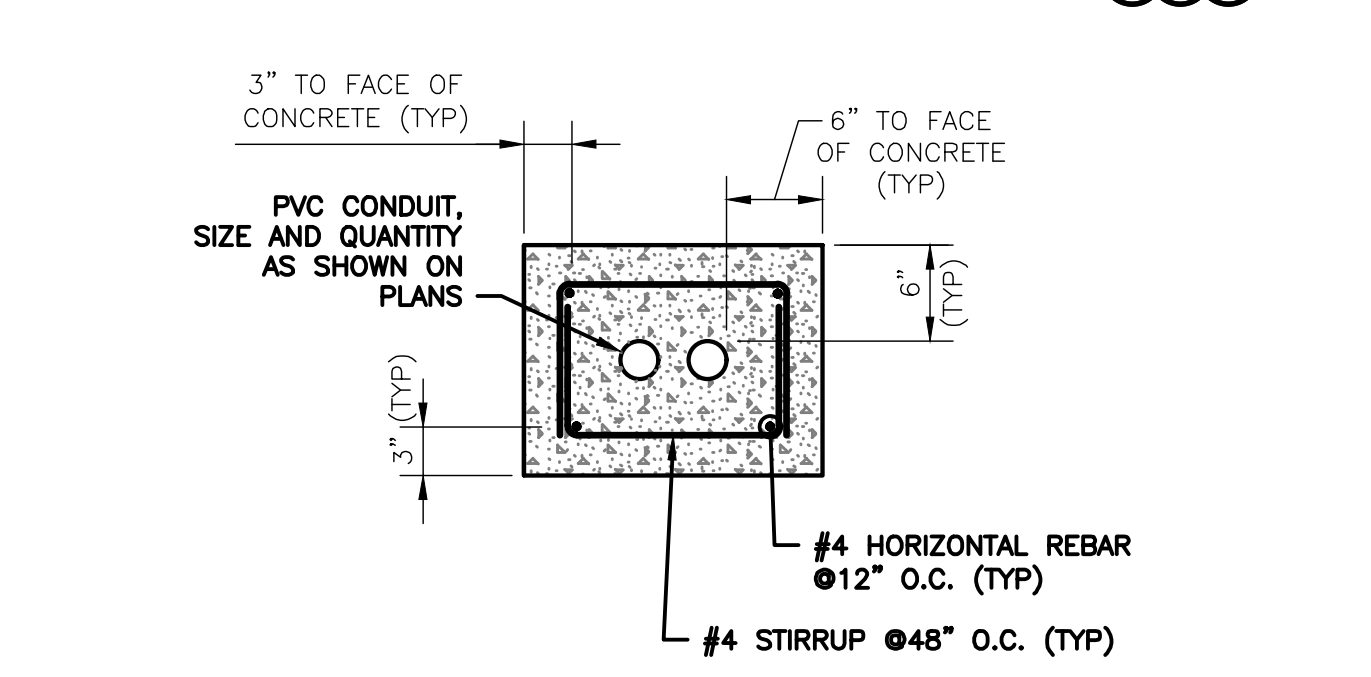
8-WAY 2-INCH CONCRETE ENCASED DUCTBANK
 NTS



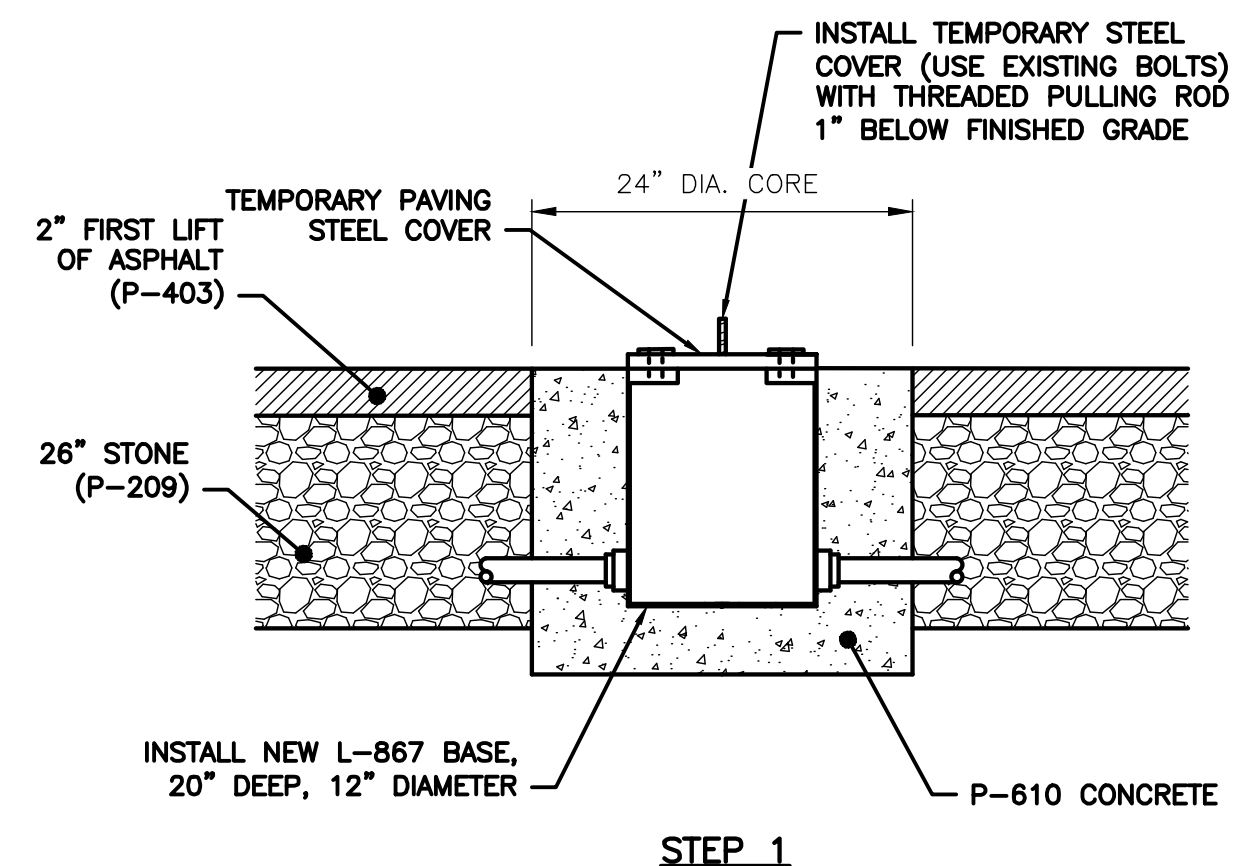
PVC CONCRETE ENCASED DUCTBANK TYPICAL REINFORCEMENT
 NTS

GENERAL NOTE:

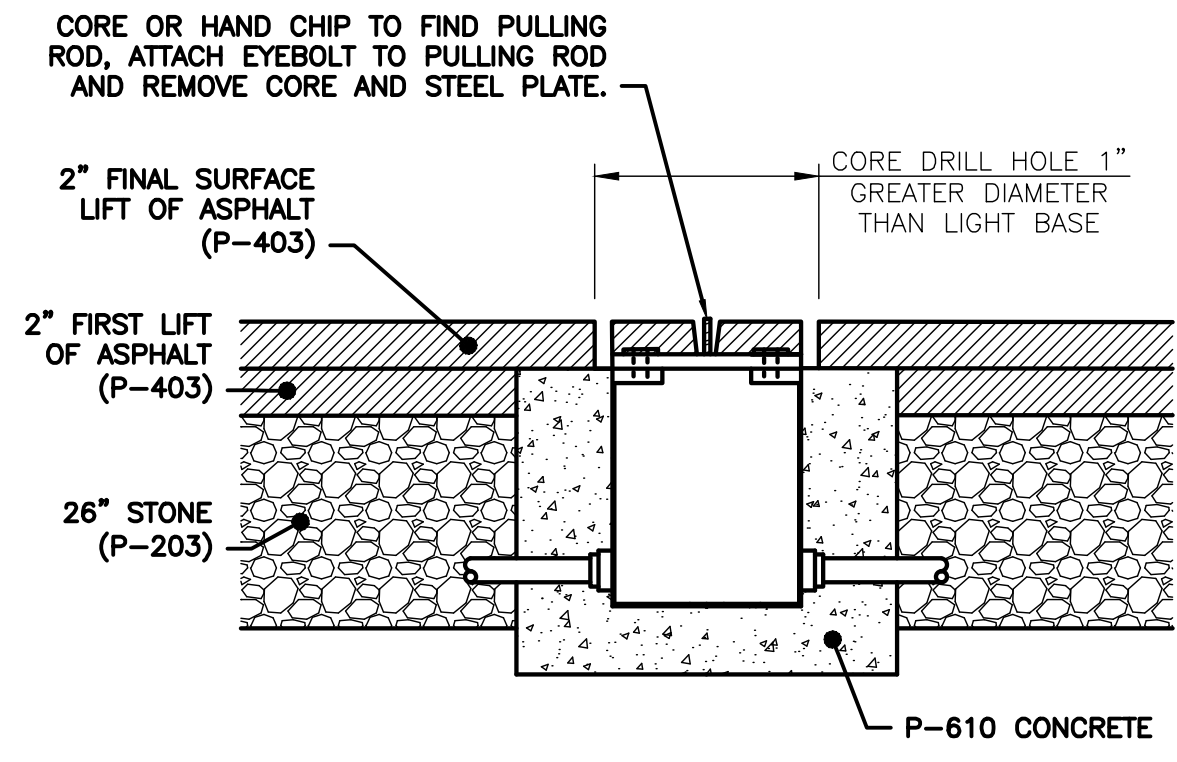
- THE DIMENSIONS SHOWN ON THIS DETAIL 8 SHALL BE EXTRAPOLATED FOR ANY CONCRETE ENCASED DUCTBANK REQUIRING REINFORCEMENT.



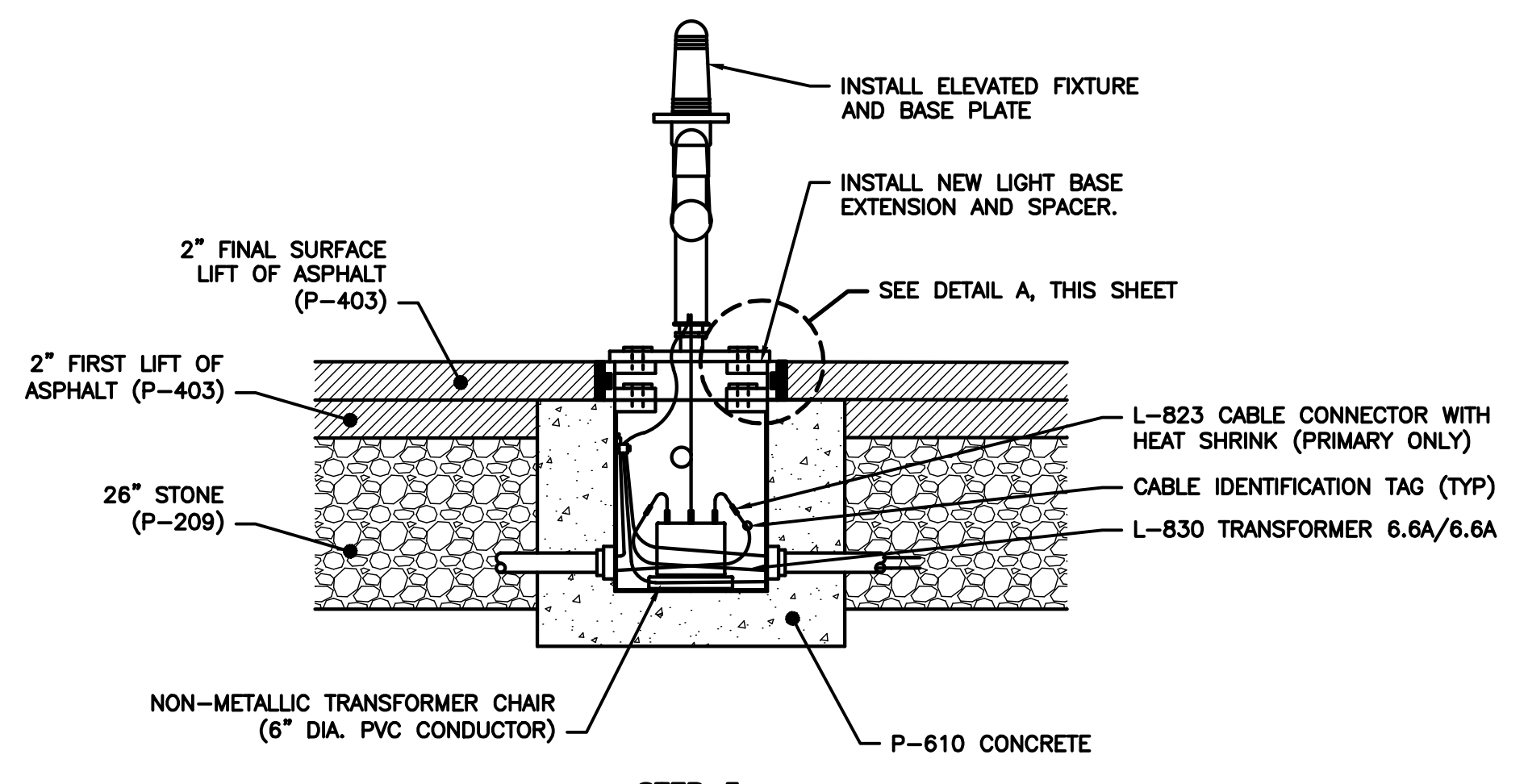
PVC CONCRETE ENCASED DUCTBANK TYPICAL REINFORCEMENT
 NTS



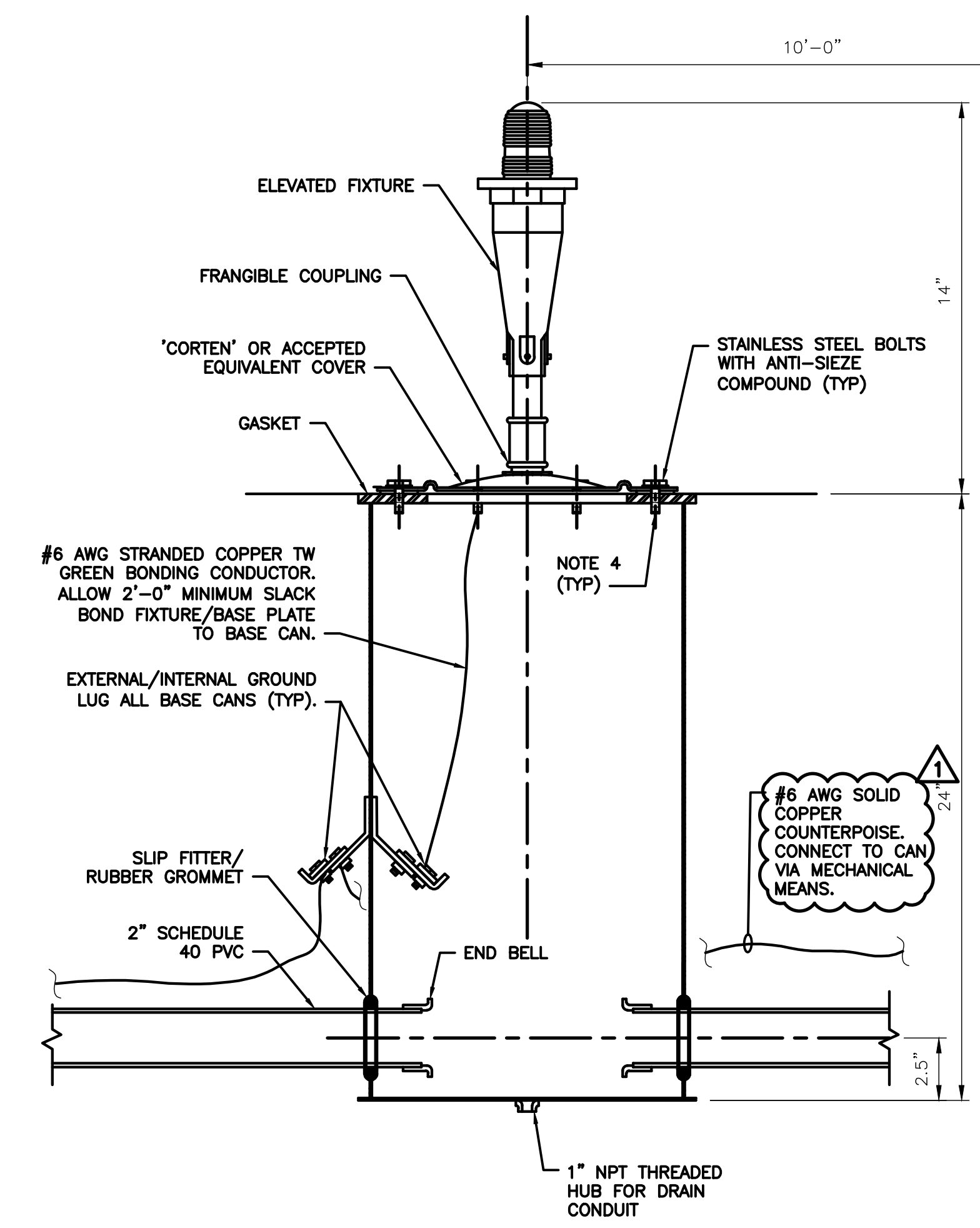
STEP 1



STEP 2



STEP 3

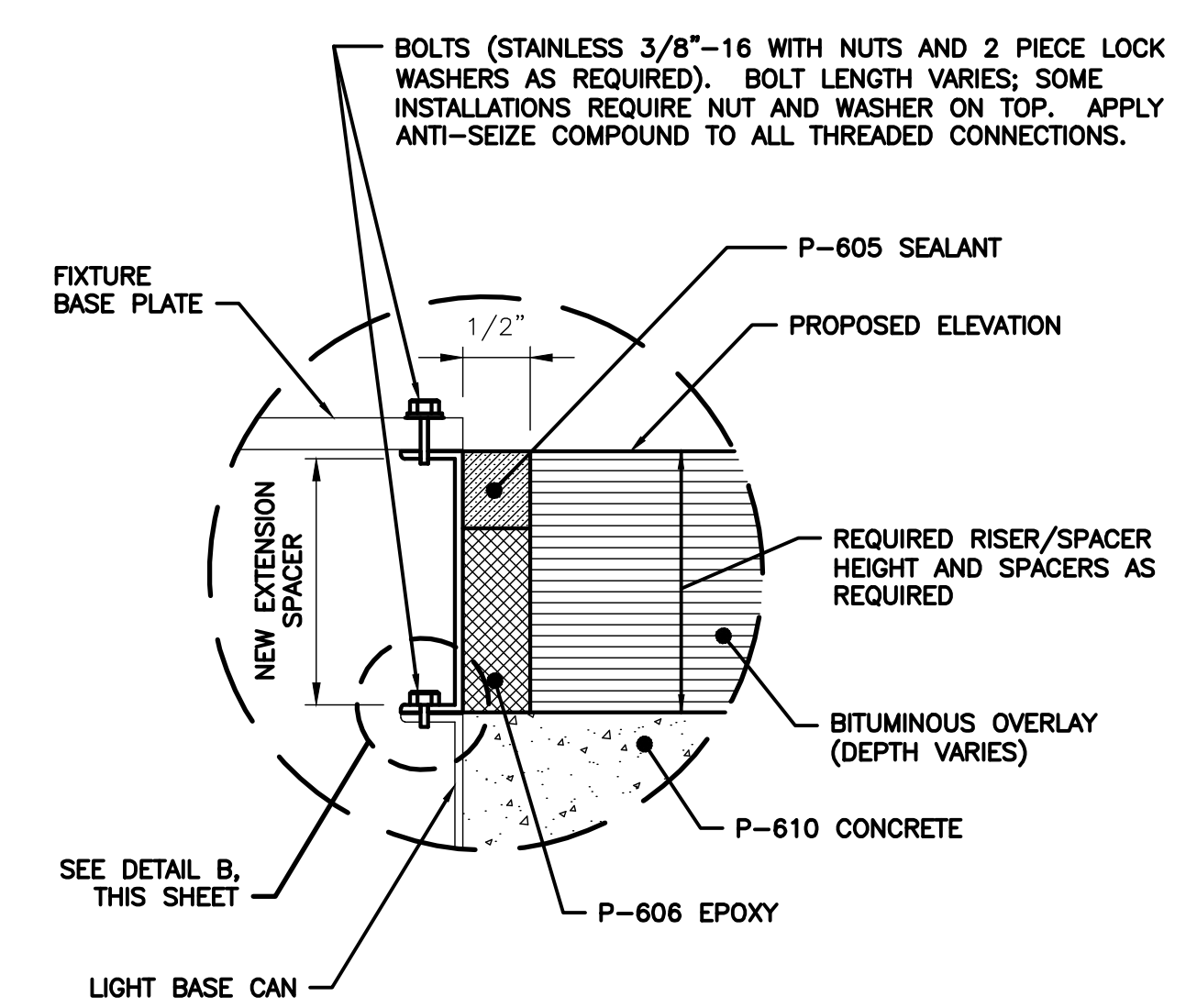


3 TYPICAL L-867B BASE CAN NTS

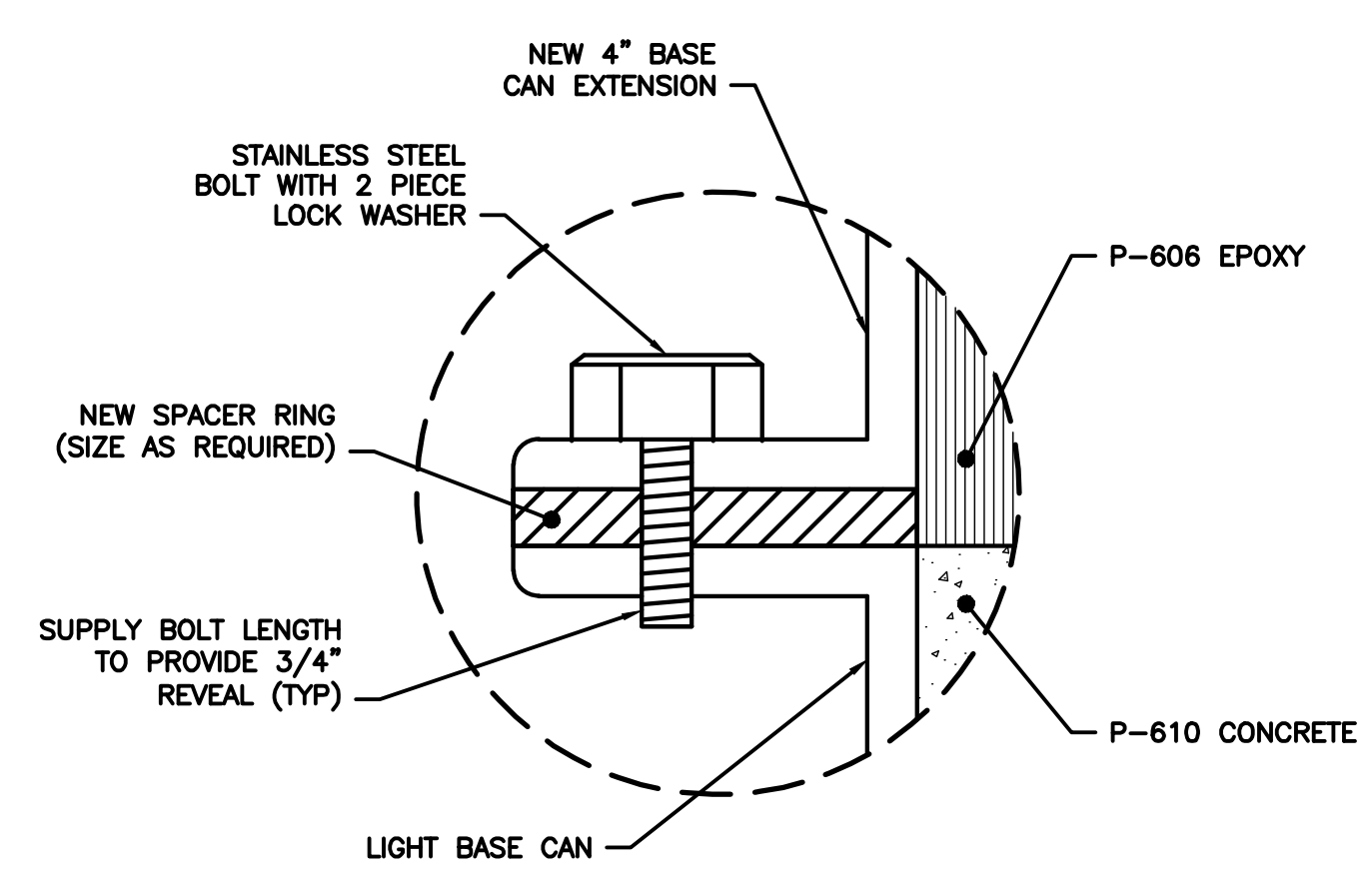
1 NEW ELEVATED LIGHT FIXTURE INSTALLATION METHOD IN ASPHALT SHOULDER DETAIL NTS

GENERAL ELEVATED FIXTURE NOTES:

- TAXIWAY LIGHTS SHALL BE 14" HIGH UNLESS NOTED OTHERWISE IN THE CONTRACT DOCUMENTS.
- ALL BASE CAN INSTALLATION TECHNIQUES, METHODS, MATERIALS, ETC. SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO THE START OF WORK.
- THE FINISHED PAVEMENT SURFACE SHALL BE PROTECTED FROM FOREIGN SUBSTANCES WHICH COULD CAUSE STAINING, (IE. CONCRETE, OIL, ETC.) THE CONTRACTOR SHALL IMMEDIATELY CLEAN ALL SPILLS AND CORRECT/CLEAN ANY STAINED SURFACES AT THE CONTRACTOR'S EXPENSE.
- THE BASE CAN COVER MOUNTING BOLTS SHALL EXTEND THRU THE BASE CAN MOUNTING FLANGE INTO THE BASE CAN A MIN. OF 0.5". THE BOLTS SHALL HAVE ENOUGH THREAD LENGTH SO THEY DO NOT SHOULDER OUT BEFORE THE FIXTURE IS SECURELY TIGHTENED. ALL BOLTING HARDWARE SHALL BE STAINLESS STEEL AND INSTALLED WITH ANTI-SIEZE COMPOUND.
- P-610 CONCRETE AROUND BASE CANS SHALL BE COMPLETELY CONSOLIDATED BY MECHANICAL MEANS AND SHALL BE FREE OF ANY VOIDS.
- BASE CANS SHALL BE LEVEL WITHIN ONE DEGREE. CONTRACTOR SHALL BE RESPONSIBLE TO LEVEL (WITHIN ONE DEGREE) ANY BASE CANS WHICH SETTLE DURING CONSTRUCTION OR THROUGHOUT THE WARRANTY PERIOD.
- BEFORE PLACING CONCRETE THE CONTRACTOR SHALL DEMONSTRATE TO THE ENGINEER THAT THE BASE CANS ARE LEVEL AND AT THE CORRECT LOCATION, ELEVATION AND AZIMUTH.
- THE P-610 CONCRETE, FOR USE IN EXISTING PAVEMENTS, SHALL BE PER THE SPECIFICATIONS. NO CORROSIVE ADDITIVES (SUCH AS CALCIUM CHLORIDE) OR CORROSIVE MIXTURES WILL BE PERMITTED.
- CONDUIT OPENINGS SHALL BE COVERED WITH DUCT TAPE DURING CASTING PROCESS TO PREVENT DEBRIS FROM COLLECTING IN OPENINGS.
- FOR CLARITY PURPOSES DETAILS DO NOT INCLUDE ALL OF THE REQUIRED RISERS, SPACERS AND EXTENSIONS TO PERFORM NECESSARY ADJUSTMENTS.



2 DETAIL A NTS

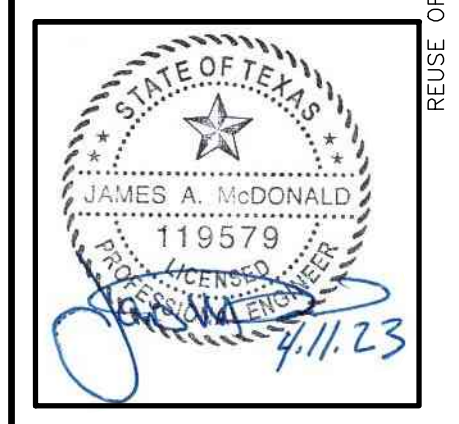


4 DETAIL B - NEW 4" BASE CAN EXTENSION NTS

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0	ISSUED FOR BID	02/24/2023	SC
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FAA NON-STANDARD TAXIWAYS PROJECT
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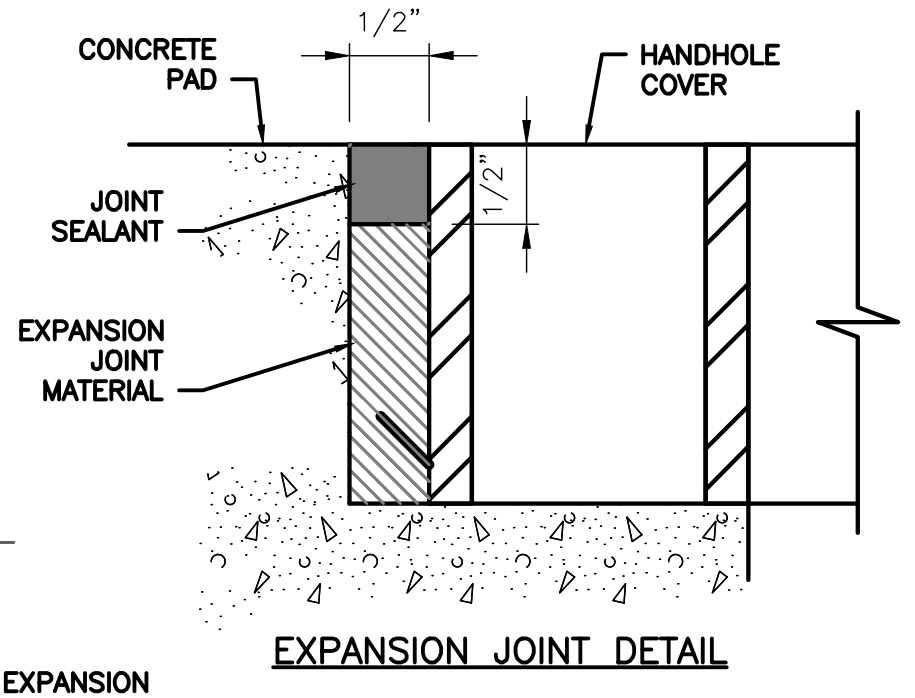
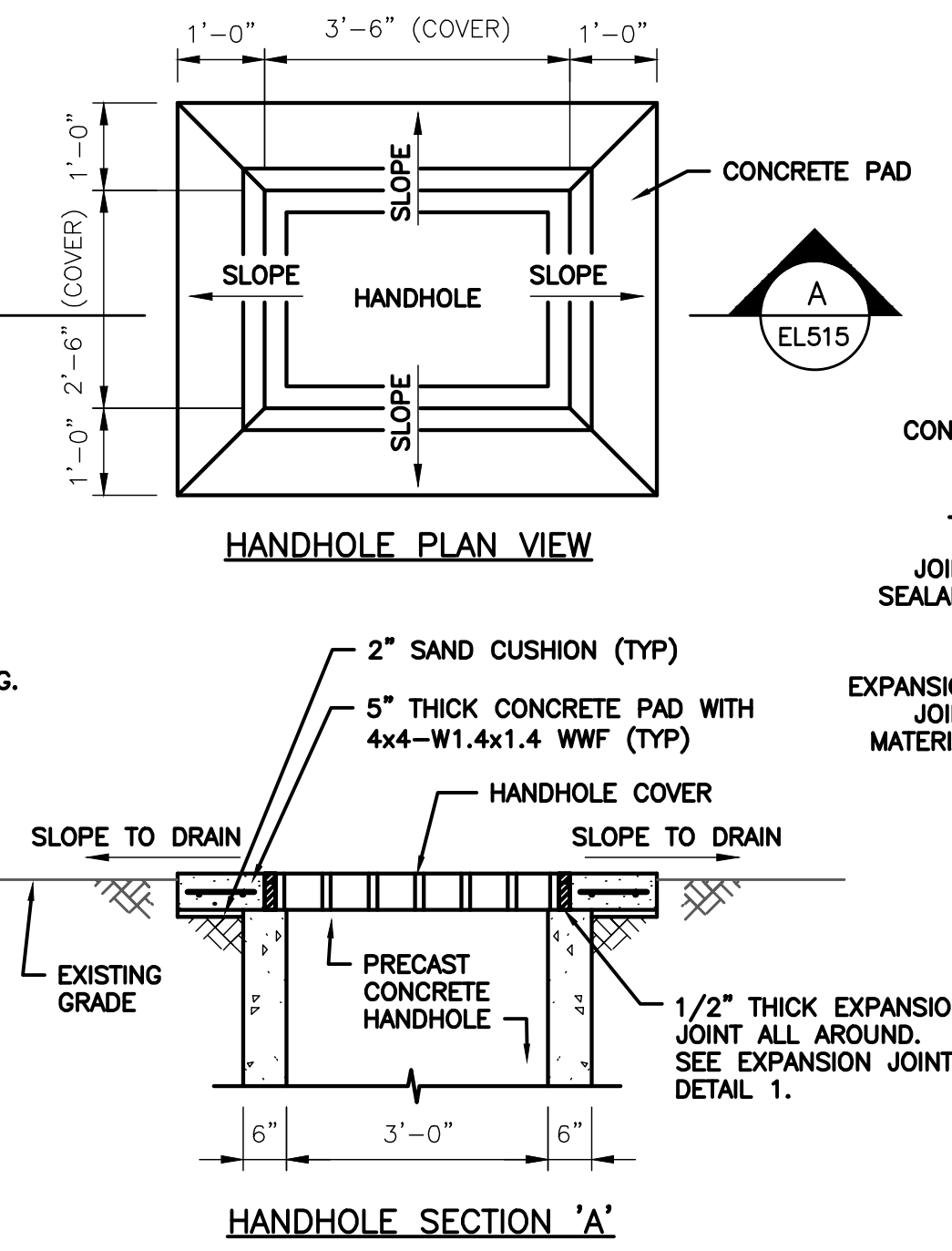
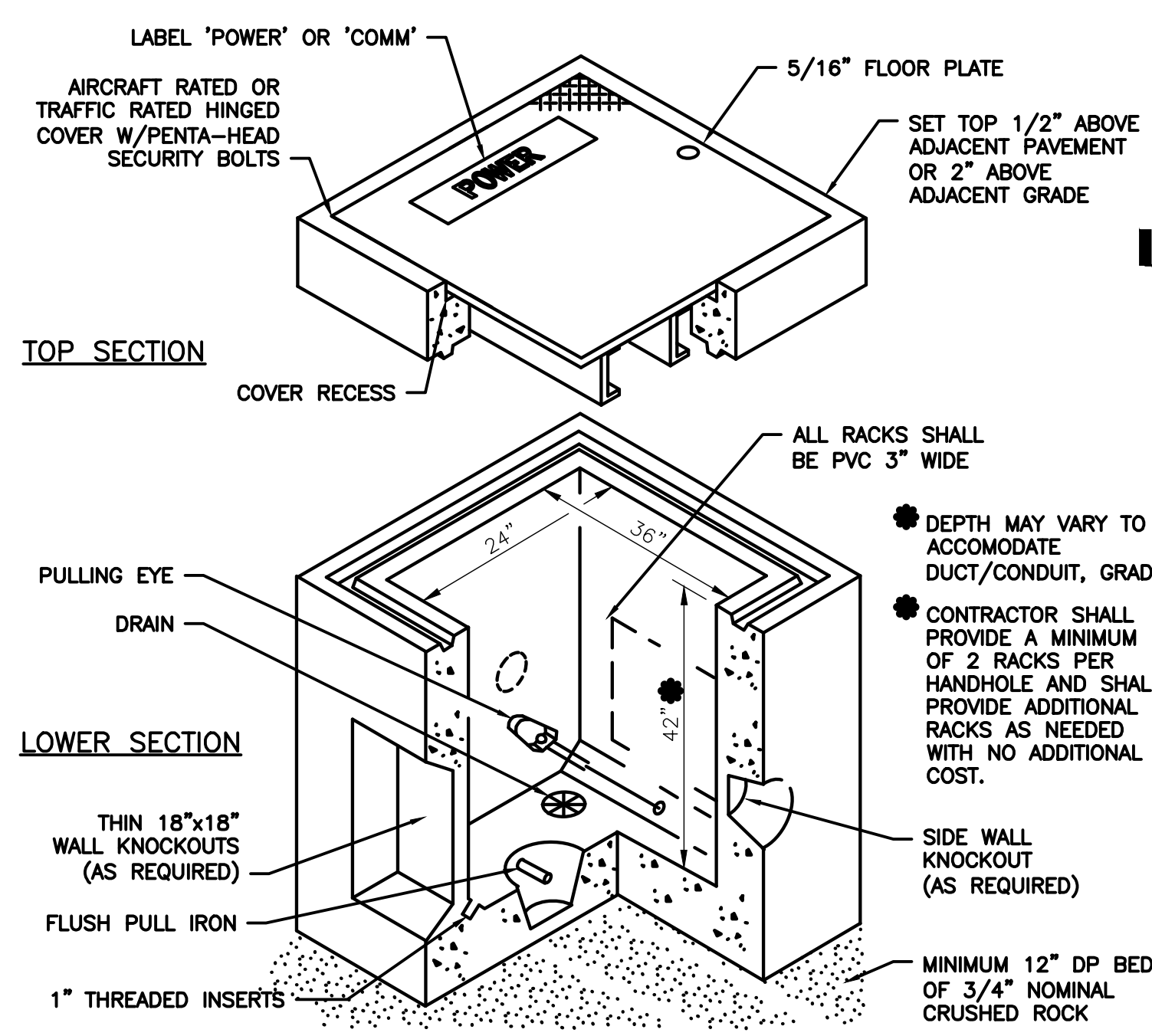


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SHEET NO:	EL512

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1	ADDENDUM 2	04/11/2023	ND



HANDHOLE NOTES:

- ALL STEEL, OTHER THAN REBAR, TO BE HOT DIPPED GALVANIZED AFTER FABRICATION.
- PROVIDE ALL HANDHOLES WITH CABLE RACKS AND PULLING EYES PER SPECS.
- ALL HANDHOLES SHALL CONFORM TO LATEST FAA, ASTM, AND AASHTO SPECIFICATIONS. HAND HOLES SHALL HAVE ADEQUATE DRAINAGE. HANDHOLES SHALL BE APPROVED BY COR. ALL HANDHOLES, PULL BOXES AND COVERS SHALL BE AIRCRAFT WEIGHT BEARING.
 TYPE A:
 24"x36"x42" D PRECAST CONCRETE, AIRCRAFT LOAD RATED, EXTRA HEAVY-DUTY, (OLDCASTLE PRECAST INC. OR APPROVED EQUAL) WITH GALVANIZED, AIRCRAFT LOAD RATED BOLT-DOWN FRAME WITH HINGED AND TORSIONED SPRING ASSIST DOOR ASSEMBLY (INWESCO OR APPROVED EQUAL).
- INSTALL HANDHOLES PARALLEL TO ADJACENT INFRASTRUCTURE (EG LT STA PLOT BOUNDARIES).
- PROVIDE ANTI-SIEZE FOR BOLT THAT SECURE THE LID CLOSED, CHEMPLEX 825 OR APPROVED EQUAL.
- PROVIDE DRAIN WITH CONE GRATE.
- PROVIDE MFOR DWGS AND STRUCTURAL CALCS FOR ALL CONCRETE ELEMENTS OF HANDHOLES AND FABRICATED TRAFFIC LIDS.
- PROVIDE/MAINTAIN SEPARATION (MIN 6") BETWEEN PWR AND CNTL CABLES WITHIN HANDHOLES.

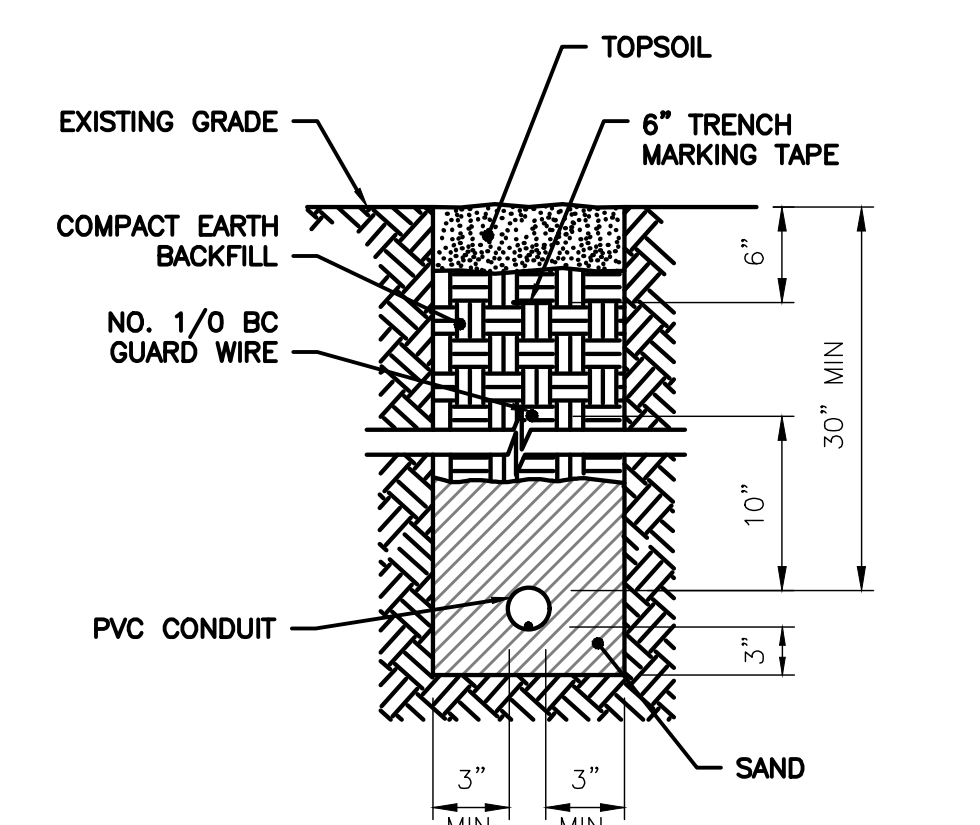
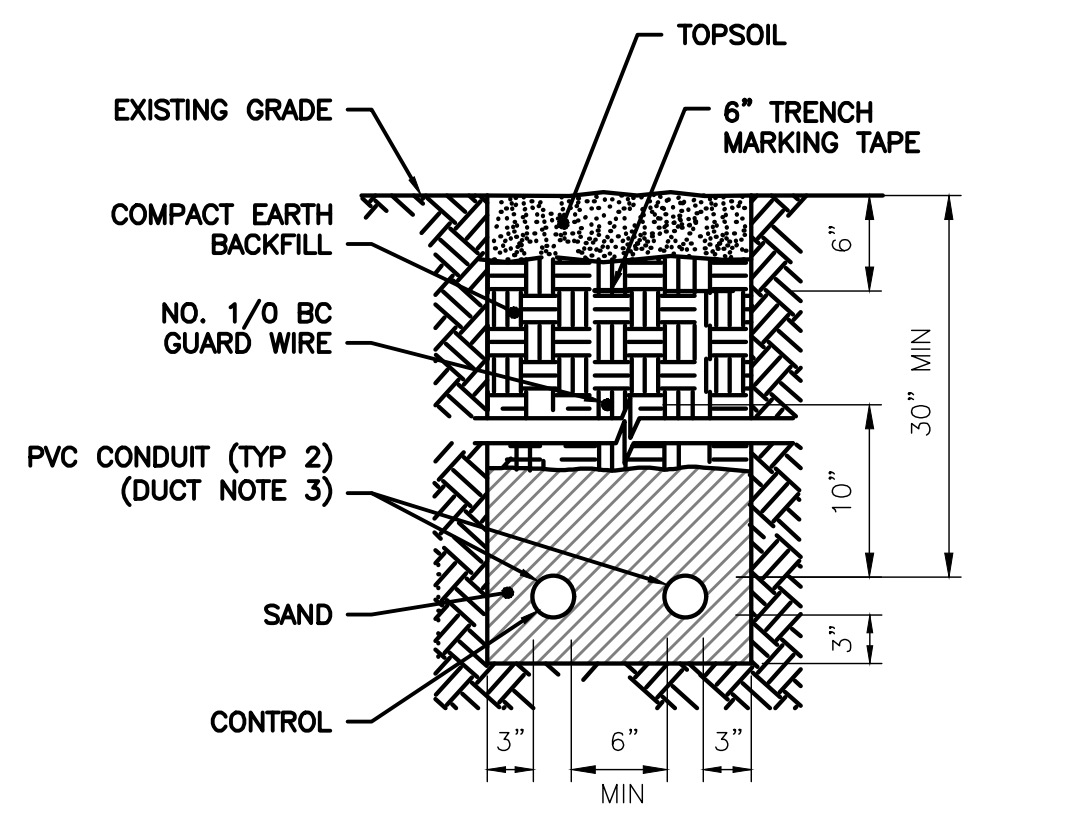
GENERAL NOTES:

- ALL WORK SHALL BE DONE BY EXPERIENCED PERSONNEL ENGAGED IN THIS TYPE OF WORK. ALL CABLE SPLICES SHALL BE PERFORMED BY EXPERIENCED, QUALIFIED CABLE SPLICERS AND APPROVED BY COR.
- THE CONTRACTOR SHALL TAKE ALL REASONABLE PRECAUTIONS TO PROTECT EXISTING UNDERGROUND UTILITIES SUCH AS FUEL TANKS, WATER LINES, BURIED CONTROL AND POWER CABLES, ETC.
- TRENCHES SHALL BE BACKFILLED AS FOLLOWS: THE TRENCH SHALL BE BACKFILLED IN AT LEAST TWO LAYERS WITH EXCAVATED MATERIAL NOT LARGER THAN 4" IN DIAMETER AND THOROUGHLY COMPACTED TO 95% THE DENSITY OF THE SURROUNDING UNDISTURBED SOIL.
- TRENCHES SHALL NOT BE EXCESSIVELY WET AND SHALL NOT CONTAIN POOLS OF WATER DURING BACKFILLING OPERATIONS.
- ALL AREAS DISTURBED BY THE TRENCHING, STORING OF DIRT, CABLE LAYING, PAD CONSTRUCTION, AND OTHER WORK SHALL BE RESTORED TO THEIR ORIGINAL CONDITIONS.
- IF SPACE IS AVAILABLE CABLE SLACK FOR 1 SPLICE (10') PER CABLE SHALL BE LEFT IN EACH HANDHOLE.
- POWER AND OTHER TYPE CABLES SHALL BE INSTALLED ON OPPOSITE SIDES IN HANDHOLES. IN ADDITION, THE ENTIRE EXPOSED LENGTH OF ALL CONTROL, TELEPHONE, AND COAXIAL SHALL BE FIREPROOFED A 1/4" MINIMUM THICKNESS OF ARC-PROOFING 3M NO.7700 OR EQUAL, IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. CABLES SHALL BE CAREFULLY FORMED AROUND THE INTERIOR OF THE HANDHOLES AVOIDING SHARP BENDS OR KINKS. ALL SPLICES AND CABLES SHALL BE TIED TO CABLE RACKS USING 1/8" NYLON LINE. HANDHOLE RACKS SHALL BE PLASTIC TYPE OR PROVIDED WITH PORCELAIN INSULATORS.
- ALL CABLES SHALL BE TAGGED IN EACH HANDHOLE WITH NOT LESS THAN 2 TAGS PER CABLE, ONE NEAR EACH DUCT ENTRANCE HOLE. TAGS SHALL BE ATTACHED TO THE CABLE IMMEDIATELY AFTER INSTALLATION.
- CONTRACTOR SHALL INSTALL 10"x3/4" GROUNDING RODS AT VARYING INTERVALS OF 90'-110' IN TRENCH AND BOND TO GUARD WIRE. THE NO.1/0 BC GUARD WIRE SHALL BE BONDED TO EES AT EACH END AND TO GROUND RODS.
- PROVIDE CONCRETE PAD AROUND HANDHOLES. SEE DETAIL 2/G003.
- CONTRACTOR SHALL PROVIDE A NO.2 AWG BC FROM THE NEARBY GROUND ROD TO PROVIDE ANY METALLIC ITEMS INSIDE THE HANDHOLES.

DUCT NOTES:

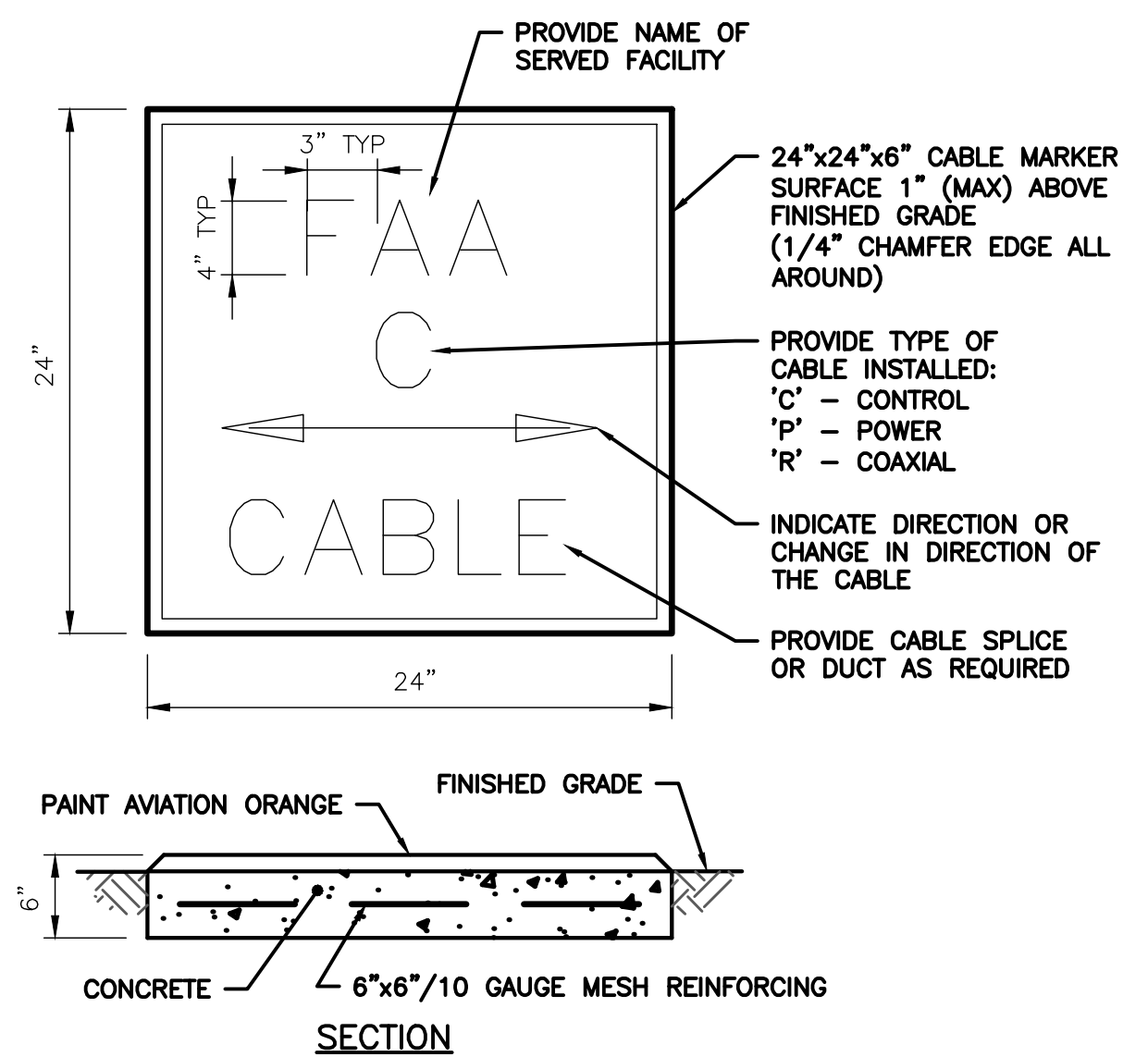
- ALL CABLES, DUCTS AND CONDUITS SHALL BE INSTALLED AS FOLLOWS:
 - DIRECT EARTH BURIAL CABLES ARE NOT APPLICABLE TO THIS PROJECT.
 - SAND ENCASED DUCT SHALL BE INSTALLED SO THAT THE TOP OF THE SAND IS NOT LESS THAN 24" BELOW THE FINISHED GRADE.
- CABLES INSTALLED IN DUCT SHALL HAVE CABLE MARKERS INSTALLED EVERY 200' AT EACH END OF DUCTS, AND EACH CHANGE IN DIRECTION OF DUCT, EXCEPT MARKERS SHALL NOT BE USED IN CONCRETE OR ASPHALT SURFACES. SEE RE FOR DIRECTIONS.
- NUMBER OF CONDUITS, AND THEREFORE, WIDTH OF TRENCH MAY VARY. MAINTAIN 3" CLEARANCE BETWEEN CONDUIT AND SIDE OF TRENCH AND 6" CLEARANCE BETWEEN CONDUITS FOR POWER AND CONTROL CABLES.

1 TYPICAL FAA HANDHOLE (36"x24")
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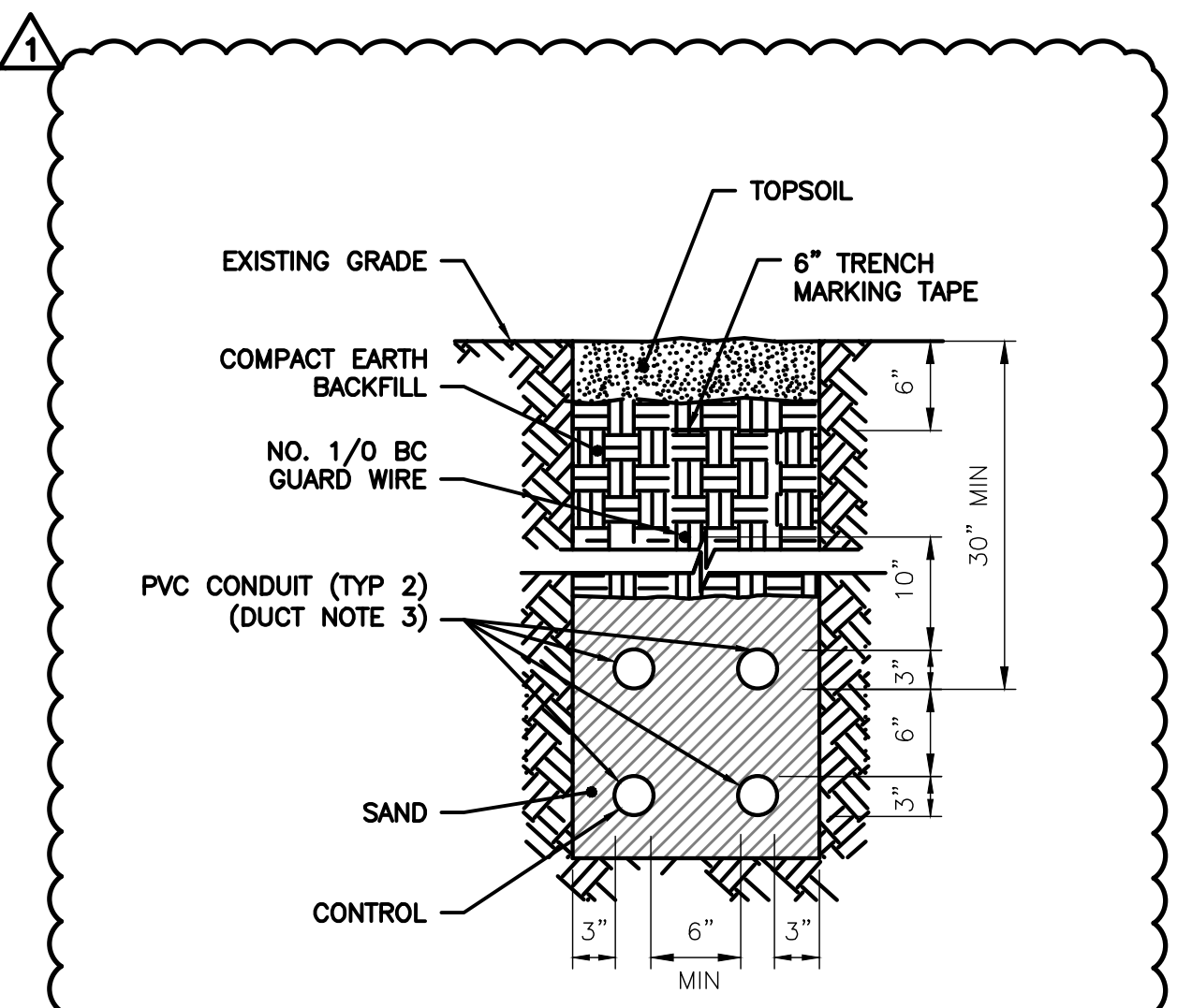


2 CABLE TRENCH DETAIL TWO CONDUIT
 NTS

3 CABLE TRENCH DETAIL ONE CONDUIT
 NTS

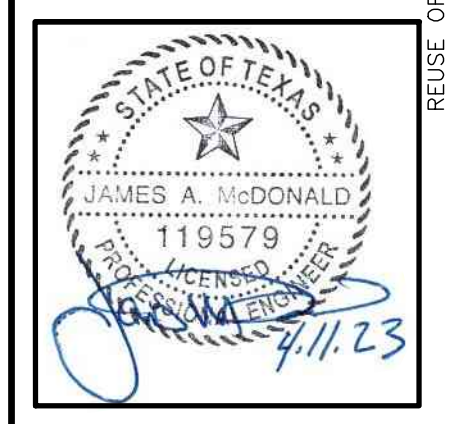


4 DUCT MARKER DETAIL
 NTS



5 CABLE TRENCH DETAIL FOUR CONDUIT
 NTS

PROJECT MGR:
 DESIGNER:
 DRAWN BY:
 CHECKED BY:
 SCALE: AS SHOWN
 DATE: 04/11/2023



APPROVED BY: DATE:
 DIRECTOR HOUSTON AIRPORT SYSTEM
 PROJECT NO: 770
 C.I.P. NO: 3-48-0110-044
 H.A.S. NO: N/A
 SHEET NO: EL515